REGIONAL GEOLOGICAL M
NORTHEAST PAC

STANDARD NAVY OCEAN AREA NP-9

COMPILED BY

WILLIAM T. MORTON
Naval Oceanographic Office

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ACKNOWLEDGMENTS

This report is a synthesis of published and unpublished maps and data. Published sources are cited in the text. The bathymetry map is a revision of an earlier map compiled by Alan Klavans, Joe Flanagan, Lavern Snodgrass, Robert Murchison, and Joe Whitney (Naval Oceanographic Office). Robert Bergantino (NAVOCEANO) drew the physiographic diagram. Troy Holcombe (Naval Ocean Research and Development Activity) outlined the physiographic province map; Fred Bowles (NORDA) prepared the surface sediment type map; and J. Alan Ballard (NORDA) computed the in situ sediment velocity measurements. Publication layout and design was done by Lester Myricks (NAVOCEANO), who also produced the illustrations together with Renee Edman (Defense Mapping Agency Hydrographic Center) and Carol Grimstead (NAVOCEANO). Herbert C. Eppert, Jr. (NORDA), G. Leonard Johnson (Office of Naval Research), and Peter Vogt (Naval Research Laboratory) made useful suggestions at various stages in the compilation. Troy Holcombe and G. Lafayette Maynard (NORDA) and James Carroll, Roger Staples, and Kenneth Kaye (NAVOCEANO) reviewed this report.

FOREWORD

The maps in this folio represent a compilation and synthesis of available bathymetric, magnetic, seismic reflection, and sediment core data for the central northeast Pacific and are useful in acoustic propagation studies. Data control is presented in such a way that the maps may also be used in preparing for future surveys and research efforts. The folio also presents base maps and reference material useful for studies of the sedimentary environment for mineral exploration, determination of engineering properties, and better understanding of ecological parameters.

JOHN R. McDONNELL
Captain, USN
Commander

CONTENTS

PLATES

INTRODUCTION

A series of geophysical and geological maps of the central northeast Pacific is presented in this report as plates 1–11. The mapped area, which lies to the immediate west of California, Oregon, and Washington, corresponds to Standard Navy Ocean Area NP-9; the limits of NP-9 are 29°–49°N and 115°–150°W (plate 1). Selected examples of representative seismic reflection profiles are displayed in the appendix.

The data used to prepare these maps came principally from the Naval Oceanographic Office (NAVOCEANO), the Defense Mapping Agency Hydrographic Center (DMAHC), Scripps Institution of Oceanography (SIO), Lamont-Doherty Geological Observatory of Columbia University (LDGO), the National Oceanic and Atmospheric Administration (NOAA), the Deep-Sea Drilling Project (DSDP), the Naval Undersea Center (NUC), and the U.S. Geological Survey (USGS).

Previously published geophysical maps and data have been included in this folio or incorporated into its maps, and a number of those that were used are listed here. Recent bathymetry maps of the North Pacific were compiled by SIO under contract to NAVOCEANO, and published as the "Bathymetric Atlas of the Northeastern Pacific Ocean" (U.S. Naval Oceanographic Office, 1971). Detailed bathymetric and magnetic data for the northern part of NP-9 are presented in the NOAA Sea Map Series (National Oceanic and Atmospheric Administration, 1974). Ewing et al. (1968) prepared a regional sediment-thickness map of the North Pacific Ocean, and Silver (1971a) compiled a more detailed sediment-thickness map of Gorda Basin. A physiographic diagram of the area is included in Menard (1964). The geology of the continental slope has been described by Silver (1971b, 1971c, and 1972) and by Vedder et al. (1974). Marine sediments are described by Horn et al. (1969 and 1971). Detailed deep sea floor studies in NP-9 were described by Loughridge (1968) and Luyendyk (1970). Hamilton (1969) also synthesized existing geologic knowledge from a plate tectonic perspective. Drill sites were occupied in area NP-9 on the Deep Sea Drilling Project legs V and XVIII (McManus et al., 1970, and Kulm et al., 1973, respectively).

GEOLOGIC SETTING

Present geologic opinion accepts the plate tectonic theory that the Earth's surface is covered by a small number (10–15) of crustal (lithospheric) plates. These plates originate at spreading centers along mid-ocean ridges and move laterally away until consumed in subduction zones. Interplate sliding occurs along structural plains referred to as transform faults (Morgan, 1968, and Minster et al., 1974). Most of the deepwater marine portion of NP-9, the areas south of the Mendocino Fracture Zone, west of the Gorda and Juan de Fuca Ridges, and the land area seaward of the San Andreas Fault, are on the ocean-spanning Pacific Plate (plate 1). The small Juan de Fuca Plate lies east of the Gorda and Juan de Fuca Ridges and west of the continental margins of Oregon, Washington, and British Columbia. All the land area, except that seaward of the San Andreas Fault of California, is part of the North American Plate.

The Juan de Fuca Plate is the eastern limb of the sea floor which originated at the Gorda-Juan de Fuca Ridge axis of plate divergence. The western limb is part of the Pacific Plate. The rest of the oceanic part of the Pacific Plate, that portion south of the Mendocino Fracture Zone, is a part of the western limb of a mid-oceanic rise in the eastern Pacific Basin which has apparently been overridden by the westward advance of the North American Plate (Atwater, 1970).

In California, the San Andreas Fault is the eastern limit of the Pacific Plate. Thus, that segment of the plate boundary is one characterized by transcurrent movement. As the land west of the San Andreas Fault is part of the Pacific Plate, there is no underthrusting of lithosphere beneath the continent at this location. Since cessation of the underthrusting that once may have existed, a continental-rise-type sediment wedge has built up at the base of the continental margin north of 34°N and south of the Mendocino Fracture Zone. In the south along the southern California continental borderland, the sediment inflow has been filling several troughs and basins in a successive seaward progression. A similar cessation, or at least a large reduction of underthrusting along the eastern border of the Juan de Fuca Plate, coupled with a high rate of sediment influx from the Columbia and other rivers, has resulted in thick accumulations of sediment along the base of the continental margin off Oregon, Washington, and British Columbia.

In the deep ocean portion of NP-9, the predominant physiographic elements are alternating ridges and valleys, conical seamounts, abyssal hills, and knolls. Those ridges that trend approximately north-south are regarded as having been created by the volcanic and tectonic processes of sea floor spreading. However, detailed studies reveal fault block topography of a horst-and-graben type associated with the north-south ridges; faulting and consequent rejuvenation of topographic trends may postdate original formation of the topographic surface at the axis of plate divergence (Luyendyk, 1970). Ridges that trend approximately east-west are associated with strike-slip movement along fracture zones, i.e., the Mendocino, Pioneer, and Murray (plate 5). North of Mendocino Fracture Zone, east-west ridges mark fracture zones diminished topographically by sediment accumulations.

The larger conical knolls and seamounts of NP-9 are volcanic features probably superimposed on an existing crust subsequent to its creation along a mid-oceanic ridge. Apparently, individual outpourings of lava accumulated as submarine volcanic cones. On the Pacific Plate, certain isolated seamounts and knolls are arranged in northwest-southeast chains, or belts. It has been suggested that these chains are the result of anomalies ("hot spots") characterized by magmatic upwelling which poured out onto the sea floor surface (Morgan, 1972, and Vogt, 1972); as the plate passes over the "hot" regions, an episode of volcanism occurs, creating a volcano. A period of quiescence follows, and then another episode creates the next island in the chain. Thus, many island chains, for example, the Hawaiian Islands, seem to indicate the path of the plate over such "hot spots" (Morgan, 1972)

BATHYMETRY

The NP-9 bathymetry map (plate 2) is in uncorrected fathoms, based on an assumed average sound velocity of 800 fm/sec (1463 m/sec). It shows an obvious correlation between bathymetry and structure. Where terrigenous sediments are abundant, such as on abyssal plains and fans, the bathymetry reflects the sedimentation pattern; where terrigenous sedimentation is minor,such as on the Baja California Seamount and on the Gorda and Juan de Fuca Ridges, basement morphology controls the topography, with a minor smoothing occuring as sediments accumulate in the structural lows and form a thin veneer over the structural highs. Where the sediment cover is minimal (0.1-second, two-way travel time in thickness), topography mirrors the acoustic basement.

The track density (plate 3) used for compiling the bathymetry of NP-9 is such that large regional features are probably shown accurately. Minor features, with dimensions less than 10–15 mi (15–25 km), remain to be adequotely mapped.

PHYSIOGRAPHY

Plate 4 shows the physiographic provinces, and plate 5 gives a diagramatic display of the varied physiography of NP-9. A classification of marine physiography has been devised by Heezen et al. (1959), and discussions of the northeastern Pacific physiographic features are given by Menard (1964).

At 40°N, the Mendocino Fracture Zone bisects NP-9 into two distinct physiographic regions. In the southern region, there are two major fracture zones: the Pioneer Fracture Zone and the Murray Fracture Zone. The Pioneer Fracture Zone lies about 2° to the south, while the Murray Fracture Zone crosses the map about 7° to 10° south of the Mendocino Fracture Zone. In the south, the greatest depths lie between the Mendocino and Pioneer Fracture Zones on a regional slope dipping to the north. Except for a few isolated peaks north of the Murray Fracture Zone, the topography is relatively subdued. South of the Murray Fracture Zone, the topography is quite rugged, with numerous ridges; it is regionally about 400 fm (732 m) shallower than the area north of the fault.

North of the Mendocino Fracture Zone, the principal ridge is the combined Gorda and Juan de Fuca Ridges. This ridge abuts the Mendocino Fracture Zone at 128°W, about 400 km west of the California coast, and trends northeastward from these. It has a well-developed axial valley of approximately 500 fm (1000 m) relief. The spreading axis is sinistrally offset along the Blanco Fracture Zone. The southern segment is called the Gorda Ridge; and the northern portion, the Juan de Fuca Ridge. The Juan de Fuca Ridge is discontinuous, becoming subdued toward the north and disappearing beneath the continental margin adjacent to Canada.

The Nitinat and Astoria Deep-Sea Fans lie between the Gorda and Juan de Fuca Ridges and the continental margin. These fans coalesce and deepen regionally to the south. The Cascadia Channel serves as the separator between them. Density flows descending from the Strait of Juan de Fuca and the Columbia River also follow the Cascadia Channel. This channel passes through the Blanco Fracture Zone and proceeds westward toward the Tufts Abyssal Plain; the latter slopes westward from approximately 2000–2800 fm (3600–5200 m). Ly' :g along the continental margin, between the Mendocino Fracture Zone to the north and the Southern California Continental Borderland to the south, are the Delgada and Monterey deep-sea fans. These are coalescing aprons of sediment, lying at depths ranging from 1900 fm (3500 m) in the east to 2600 fm (4800 m) in the west. No major fans lie beyond the Southern California Continental Borderland, because the several basins in the borderland serve as sediment traps that greatly slow the seaward spread of sediments; a landward basin must be filled before the continuing influx of sediments can spill over into the next basin farther west (Vedder et al., 1974).

SURFACE SEDIMENT TYPE

The surficial sediments of NP-9 (plate 6) are divided into three major categories: terrigenous clay (red clay). terrigenous sand and silt (turbidites), and calcareous ooze and sand. The second category is subdivided to also include those areas where occurrence of turbidites is inferred, though small amounts of data exist (turibidites along fracture zones are probably locally derived). The continental shelf and slope (less than 1000 fm [1900 m] deep) are not included in this sediment classification.

Sediment core information from area NP-9 is sparse. The sediment types are normally controlled by the age-depth of the sea floor (the age of the sea floor is related to its regional depth, Sclater et al., 1971). A second factor influencing the sediment type is the calcium carbonate compensation depth (the depth below which the rate of calcium carbonate solution exceeds the rate of calcium carbonate deposition, usually 4000 5000 m deep in the Pacific), as explained by Bergen and Winterer (1974), and van Andel and Moore (1974). A third factor is the proximity of an area to continental sediment sources. Horn et al. (1971) suggested that some coarse layers in the Pacific have been deposited by bottom currents.

Deep-sea fans are a dominant feature of a belt immediately westward of the continental slope off the U.S. portion of NP-9. This extensive fan development is probably the result of turbidity current activity. Turbidity currents have also made several deep-sea channels. The seaward limit of turbidites found in deep-sea cores is indicated by Horn et al. (1969, 1971). The occurrence of calcareous ooze is limited to regions shallower than the calcium carbonate compensation depth. Thus, it is assumed that the sediment cover is calcareous only on isolated seamounts, where the bottom rises above the calcium carbonate compensation depth. Samples from the Juan de Fuca and Gorda Ridges verify the occurrence of calcareous ooze. The Mendocino, Pioneer and Murray Fracture Zones probably contain a mixture of terrigenous clay and silty turbidite layers. Volcanic ash occurs in several areas north of 35°N, but not south of 35°N (Horn et al., 1969, plate 6).

The terrigenous "red clays," or brown deep-sea lutites, are extremely uniform, both vertically and horizontally, and they contain manganese micronodules, occasional volcanic shards, fish teeth, and locally derived volcanic turbidites (Fairbridge et al., 1966).

SEDIMENT THICKNESS

Single-channel seismic reflection records were used in the compilation of the NP-9 total sediment thickness map (plate 7). Most of these records are from NAVOCEANO and NOAA surveys. Additional data were acquired from SIO, LDGO, and USGS. These records represent the majority of existing deep-ocean (seaward of the 100 fm [200 m] isobath) seismic data for NP-9. Seismic reflection data coverage is indicated by dashed lines.

Sample seismic reflection records (figs 1–8) in the appendix show and acoustically transparent surface layer. This layer is conformable to the bathymetry and has a thickness ranging from 0 to 1-sec two-way travel time. Below the transparent layer is an acoustically opaque layer that is distinguishable from basement by its smooth upper surface. The deepest observed layer (designated acoustic basement), is characteristically quite rough. Where there are appreciable thicknesses of turbidites, as in abyssal fans and plains, the deposits exist as stratified layers, with individual layers ranging from obvious and continuous for regional distances, to faint and locally discontinuous.

In the Baja California Seamount Province, where the pelagic sediments range in thickness from 0 to more than 0.25-sec. two-way travel time, the regional average is 0.1 sec. In the eastern part of the Musicians Seamount Chain and in the southwestern portions of the Baja California Seamount Province (south of 32°N and west of 145°W), there is a general thickening of sediments to more than 0.2 sec. This thickening is probably the result of both turbiditc deposition from the nearby volcanic sources such as the Hawaiian Islands and from the deposition of sediments transported by bottom-water currents.

Antarctic-derived bottom water, once north of the Equator, continues as a northwest flow along the western side of the Long Island Ridge, and turns eastward at the Horizon and Clarion passages (Johnson, 1972; Johnson et al., 1974). North of the Clipperton Fracture Zone, the bottom water appears to flow east to northeast at less than 10 cm/sec. and enters NP-9.

A regional decrease in sediment thickness occurs south of the Mendocino Fracture Zone between 135°W and 145°W.

Malahoff and Woollard (1970) found that sediment thickness in the Murray Fracture Zone uniformly decreased from east to west. This characteristic thinning to the west appears in the Mendocino and Pioneer Fracture Zones as well.

North of the Mendocino Fracture Zone, greater sediment thicknesses (0.1–0.5 sec.) are associated with the turbidites of the Tufts Abyssal Plain. A sediment thickness minimum (0.1 sec.) coincides with the axis of the Juan de Fuca Ridge. Thicknesses of 0.1 to 0.3 sec. occur on the flanks of the Juan de Fuca and Gorda Ridges, where the inferred youthful age of the basement is probably balanced by the higher rates of carbonate deposition. There is a great contrast between seismic and bathymetry data coverage (compare plates 3 and 7). With the close correspondence between structure and bathymetry, topographic trends were used in locating the 0.1-sec. contour in areas of sparse seismic data coverage.

SURFACE SEDIMENT SOUND SPEED (V_o)

The computations involved in wide-angle reflection studies and refraction measurements require a knowledge of the sediment sound speed at the sediment/water interface. The surface sediment sound speed calculation is termed (V_o) in this report and is present in plate 8 for several locations in NP–9.

After a comparative study of in situ and laboratory-measured sound velocities, Hamilton (1969) concluded that only the temperature and pressure corrections need by applied to laboratory velocity measurements to obtain comparability with in situ velocity measurements. Alternatively, it is possible to use the ratio of the sound velocity in sediment to the sound velocity in seawater to determine (V_o), because the major changes in the sound velocity of the bottomwater relative to the sound velocity of the sediment pore water are caused by temperature and pressure changes. Temperature and pressure effects on the mineral grains are considered inconsequential, thus, both water and sediment velocities can be corrected to in situ conditions, and the ratio between these velocities will be constant (Hamilton, 1971).

To obtain a ratio of the sound velocity in the sediment to the sound velocity in seawater, one first measures the sediment sound velocity with a laboratory velocimeter at ambient temperature and pressure, then divides that value by the velocity of sound in seawater at 23°C, one atmosphere of pressure, and the proper salinity (Hamilton, 1971). These values are tabulated in SP–68 (U.S. Naval Oceanographic Office, 1966). With the sediment sound velocity/seawater sound velocity ratio established for the different ocean-bottom types, (V_o) becomes simply the product of the geologically appropriate ratio and the bottomwater velocity.

PALEOMAGNETIC LINEATIONS

The paleomagnetic lineation map (plate 9) was compiled from illustrations published by Menard and Atwater (1968);

Pitman et al, (1974); NOAA SEA MAP SERIES of the North Pacific Ocean (National Ocean Survey, NOS 12042-12M and 13242-12M); and Malahoff and Handschumacher (1971).

The residual magnetic intensity profiles (plate 10) include three blocks of original data: that collected by NOAA using the OCEANOGRAPHER during the SEA MAP surveys; that collected aboard the USNS SHOUP for NAVOCEANO; and that by university-sponsored oceanographic research vessels. Specific track identification is available upon request. The density of magnetic data from area NP-9 varies widely with detailed surveys of east-west tracks having been run along the continental margin and with fewer tracks in the western portion of the area. These data are a prerequisite to detailed magnetic correlations. The positive anomalies are shown as black lines on plate 9. In the area 42°-48°N; 125°-145°W, the width of the anomaly line is taken from the SEA MAP Magnetic Chart, where the greater detail is shown on the wider black anomaly patterns.

South of the Mendocino Fracture Zone, the paleomagnetic anomalies indicate an increase in crustal age toward the west with only one exception, which is located south of the Murray Fracture Zone. In this latter area, there was spreading, which ceased some 12 m.y. ago, along a ridge which is now centered at 133°W (Malahoff and Handschumacher, 1971). Thus, anomalies are younger toward the ridge. Beyond the area influenced by the spreading, the paleomagnetic anomalies continue to be older to the west. The strike-slip movement along the Mendocino, Pioneer, and Murray Fracture Zones is shown by the offset of the magnetic anomalies. Atwater (1970) attributed the lack of north-south linearity of the anomalies nearest shore, in contrast to those farther offshore, to disruptive movements of the spreading ridge prior to subduction.

North of the Mendocino Fracture Zone, sea-floor spreading is presently occurring along the Gorda and Juan de Fuca Ridges. These ridges are offset by the topographically prominent Blanco Fracture Zone. Elsewhere, offsets of paleomagnetic lineations indicate crustal strike-slip movements along fractures which now have no topographic expression. The sediment accumulations in the abyssal plains and continental rises have helped mask the original basement topography.

DEEP SEA DRILLING PROJECT (DSDP)

Plate 11 displays the locations of the drillsites occupied and drilled by the Deep Sea Drilling Project (DSDP). Specific characteristics of each station and coring results are summarized on the map. This map is included as an aid to planning for future surveys and research.

A detailed analysis of the geologic results obtained from the cores taken by the DSDP Project is beyond the scope of this report. In essence, these sites were those recommended by a Pacific Advisory Panel to investigate geological correlations with magnetic anomaly patterns and to recover continuous sedimentary sections along a longitudinal north-south profile for paleontological and stratigraphic studies. Detailed drilling and coring results can be obtained from Volume V and Volume XVIII of the Initial Reports of the Deep Sea Drilling Project (McManus et al., 1970, and Kulm et al., 1973).

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APPENDIX

The following illustrations are of single-channel seismic records collected within NP–9. All represent a 10-sec sweep, with Figure 8 displaying a 4-sec enhancement of a 10-sec record.

The horizontal scale can be inferred from the time lines on the records. Average speed of the ships appears to be 9 kn. The locations of these profiles are shown in Figure 1.

Numbers associated with the arrows on the illustrations refer to the two-way travel time. The velocity of the sound transmission will depend on the density of the medium: in seawater, 1.03 km/sec; in unconsolidated sediments, 1.6 km/sec. Thus, absolute sediment thickness is computed by multiplying the travel time by the velocity of the medium.

SEISMIC PROFILE LOCATIONS

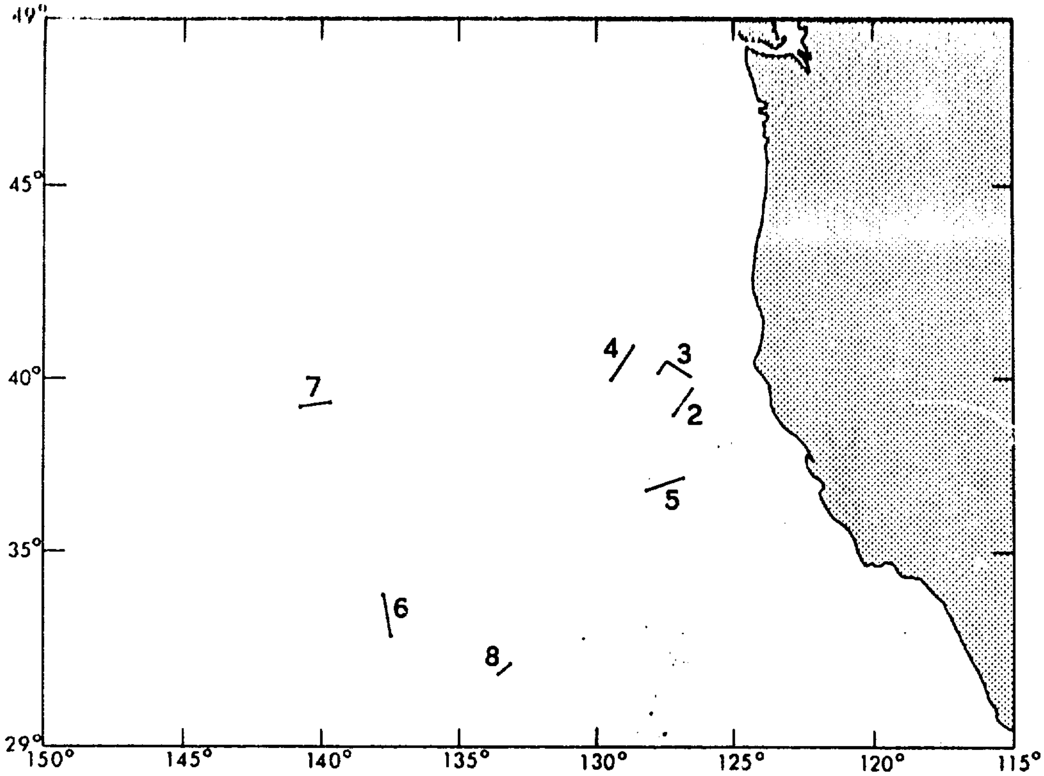


Figure 1. Map of NP-9 showing the locations and orientation of the seismic reflection profiles displayed in figures 2 through 8.

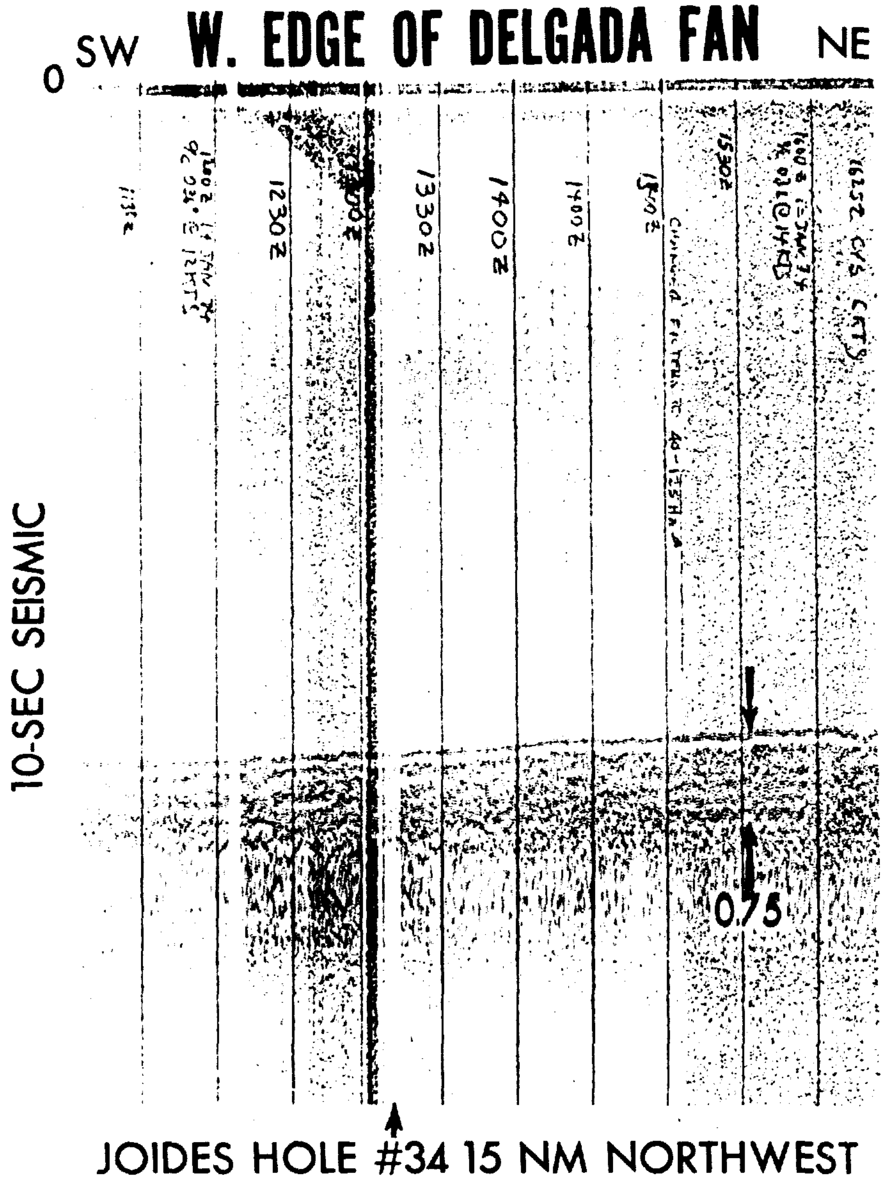


Figure 2. Acoustically transparent material overlies highly reflective stratigraphic horizons. Seismic discontinuities reveal possible structural disturbances.

CROSSINGS – E. END MENDOCINO FRACTURE

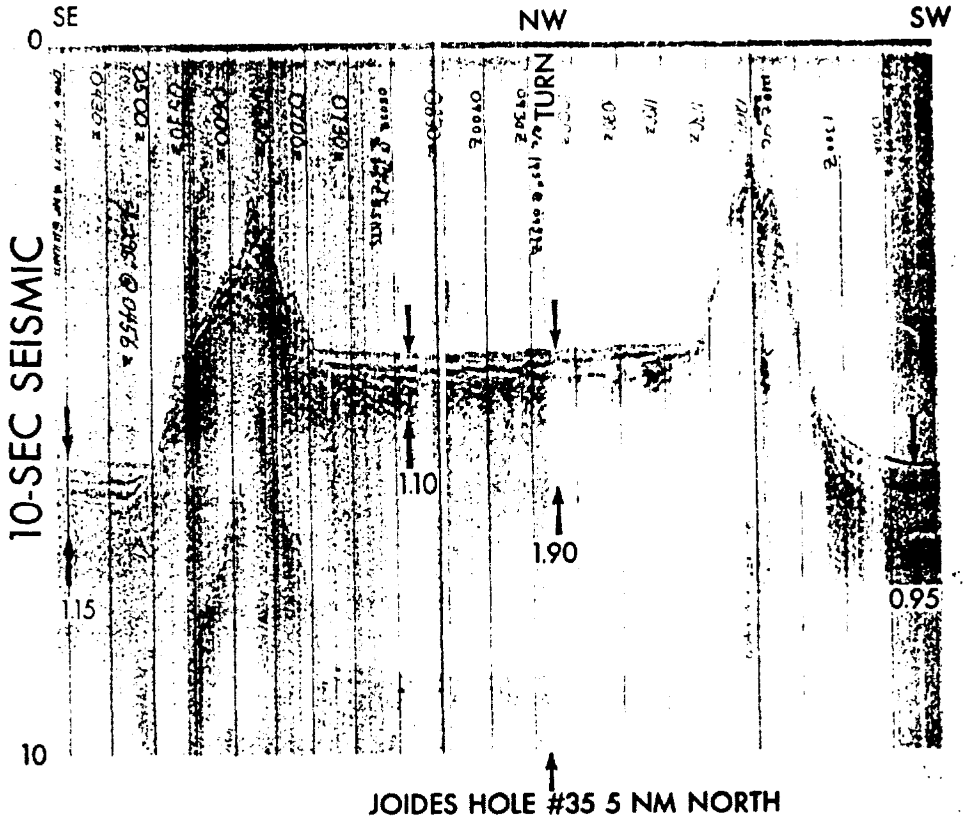


Figure 3. The plateau north of the ridge which coincides with the Mendocino Fracture Zone lies 600 fathoms shallower than the sea floor south of the fracture. With the exception of the ridges, the area is covered by turbidites as shown by the stratified sequences. Minor offsets on the plateau are suggestive of tectonic movements after turbidites were laid down.

2

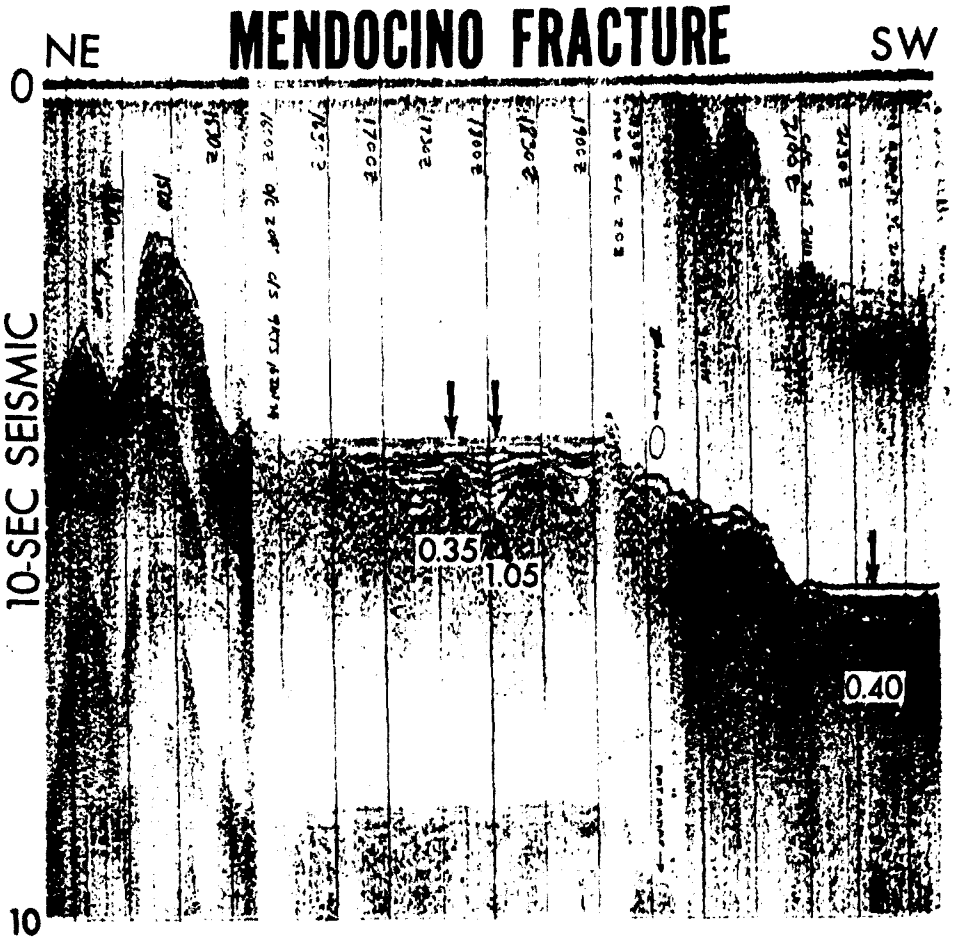


Figure 4. Note the 600-fathom escarpment and the absence of a flanking ridge. Transparent sediments overlie opaque stratified turbidites south of the fracture escarpment, with alternating sequences of transparent and opaque sediments encountered north of the escarpment. Note the relief of basement underlying sediments north of the escarpment.

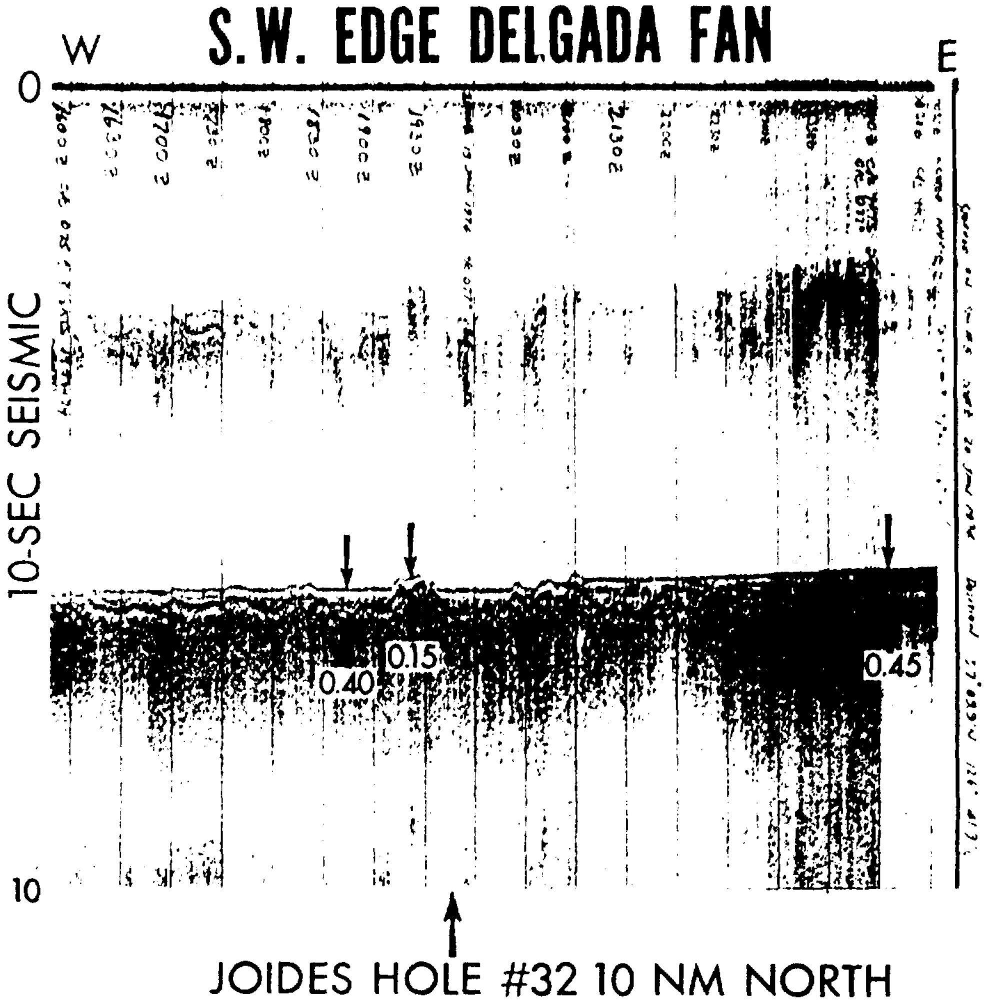


Figure 5. Here, only the most prominent basement features influence surface relief.

2

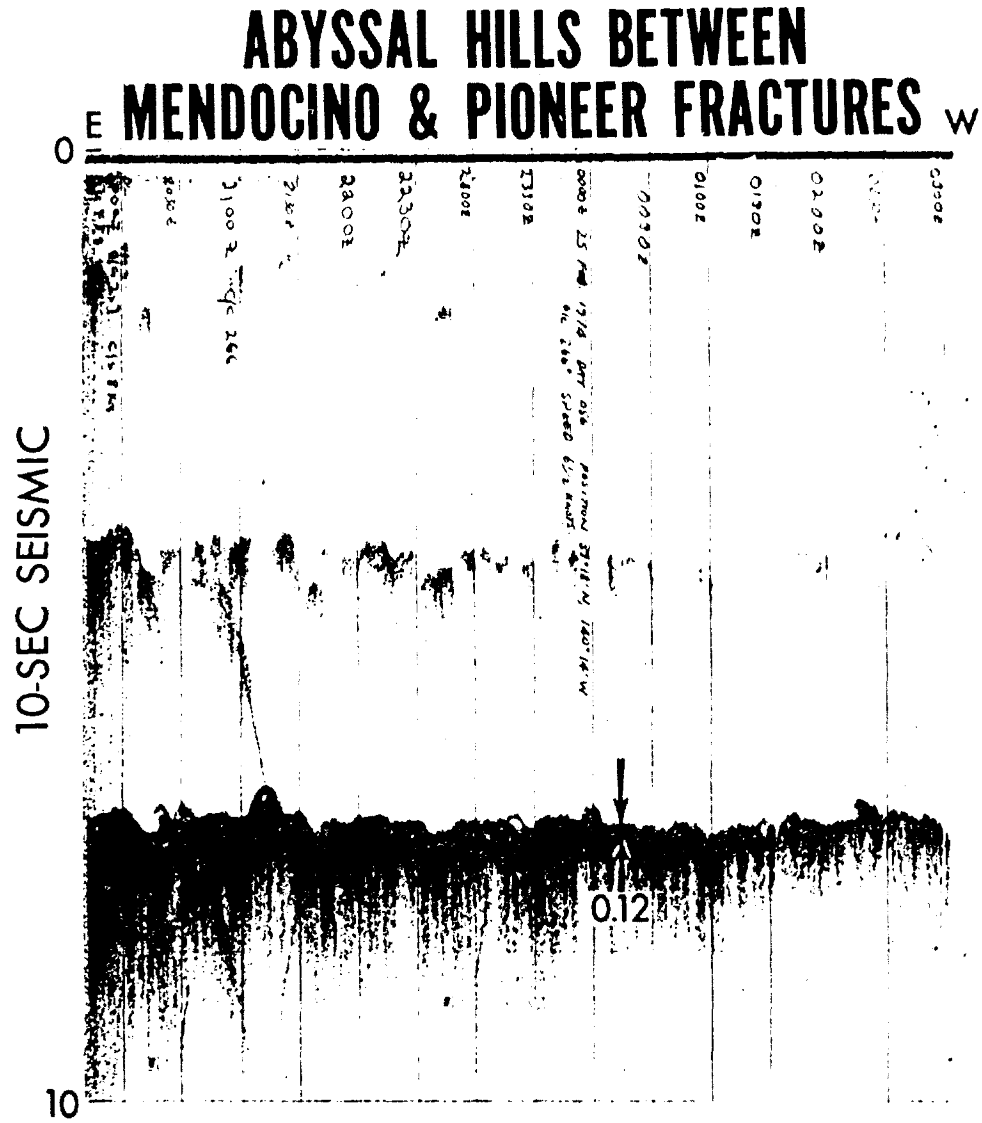


Figure 6. Here, the sediments overlying "basement" are extremely thin.

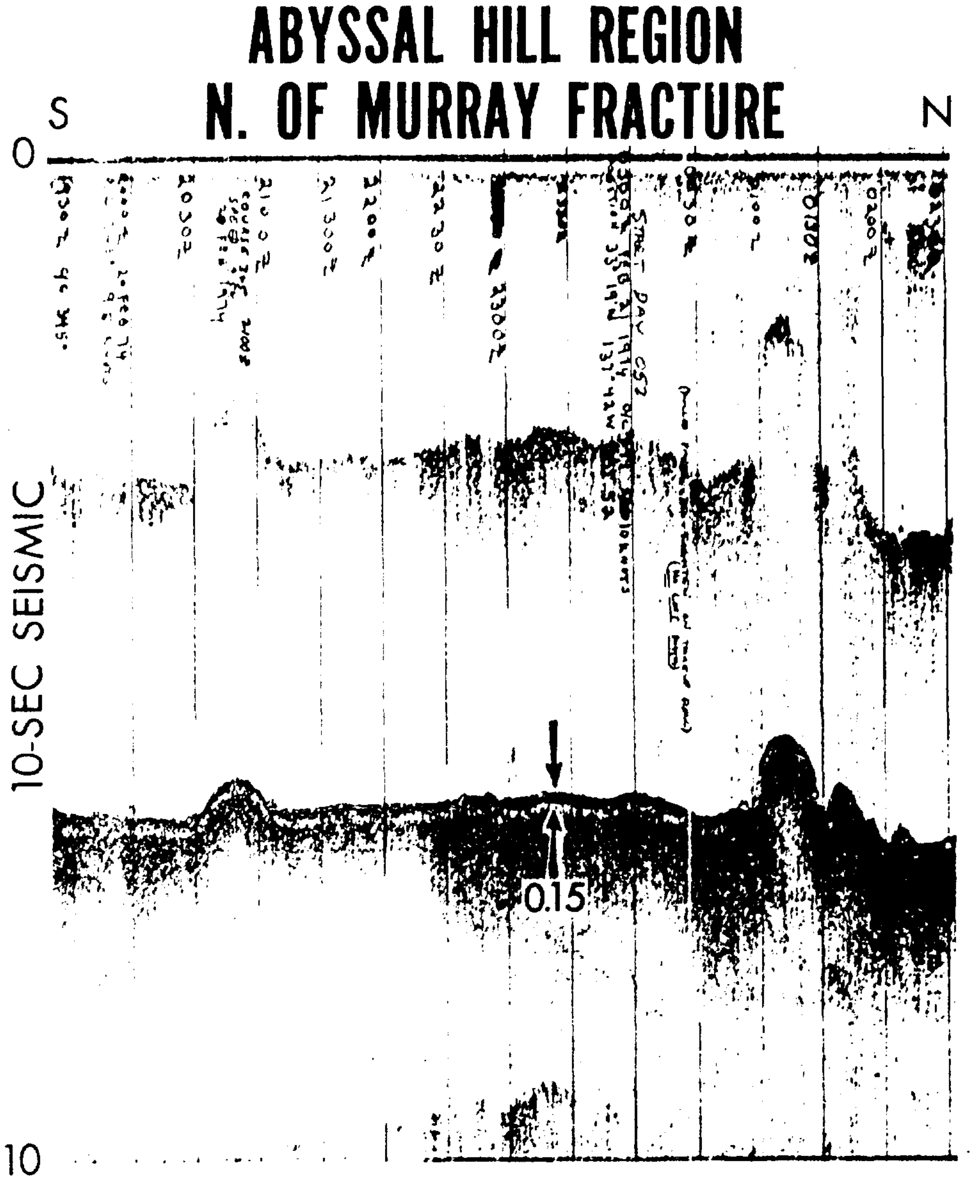


Figure 7. Note the even thickness of sediments draping basement. Acoustic basement is indistinct, which is a characteristic encountered in the Baja California Seamount Province.

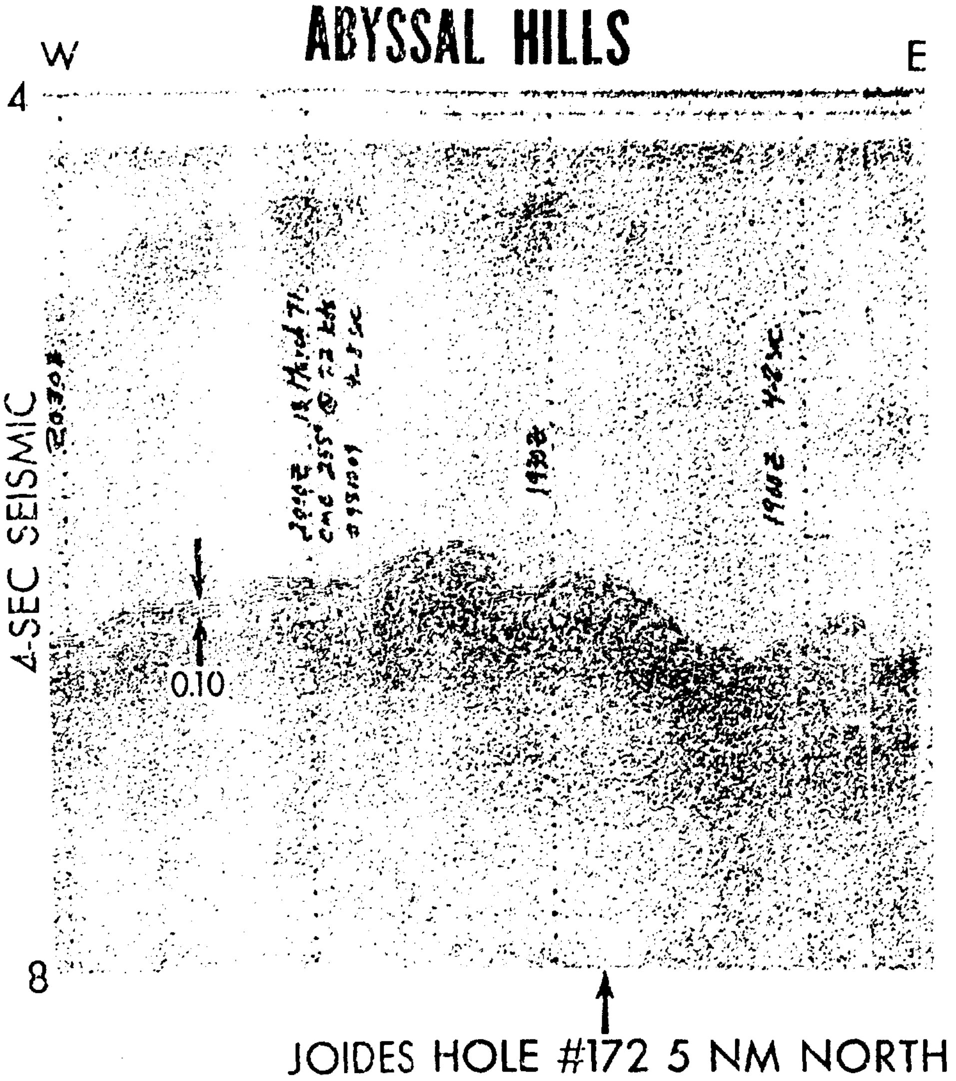
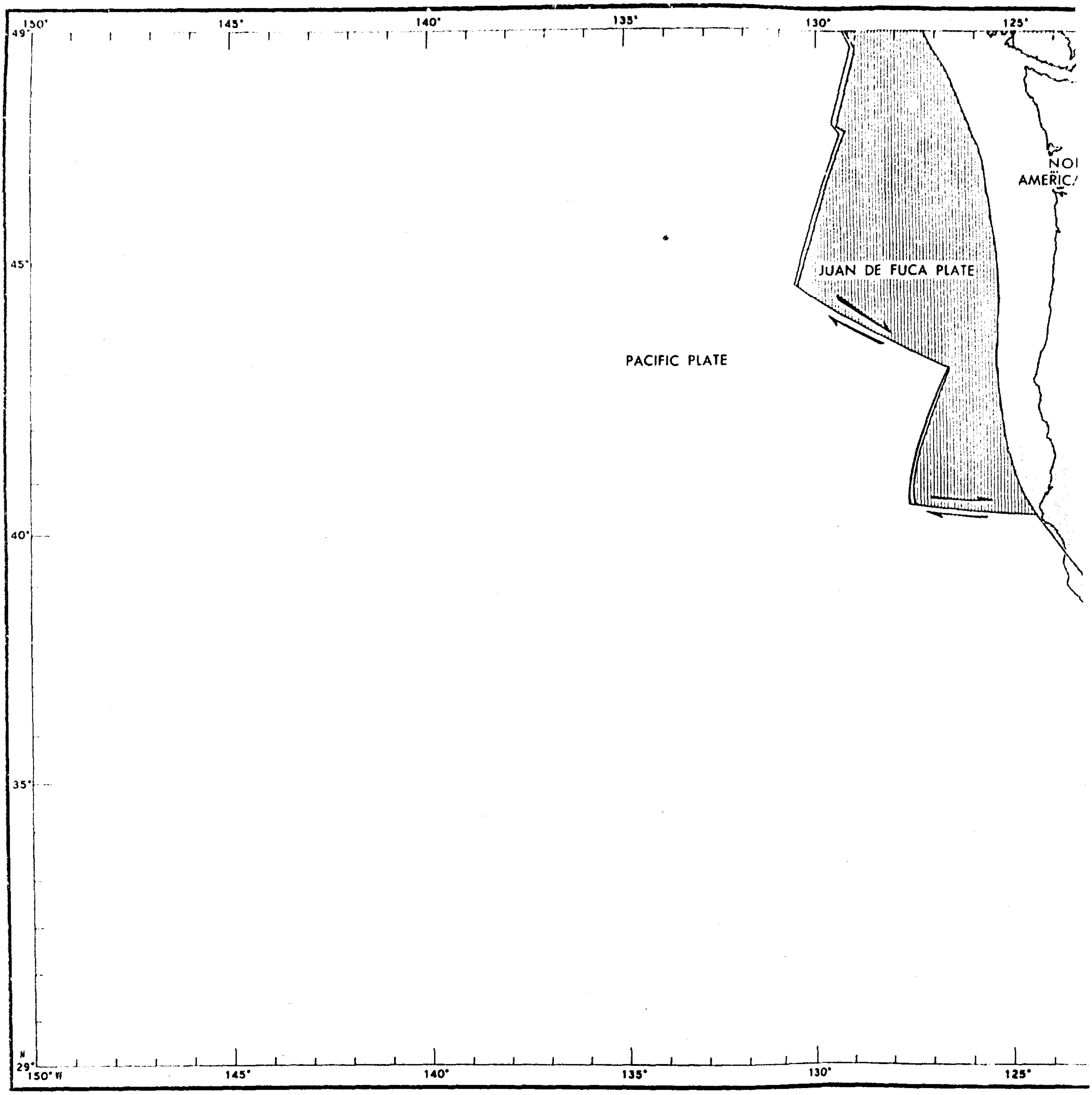


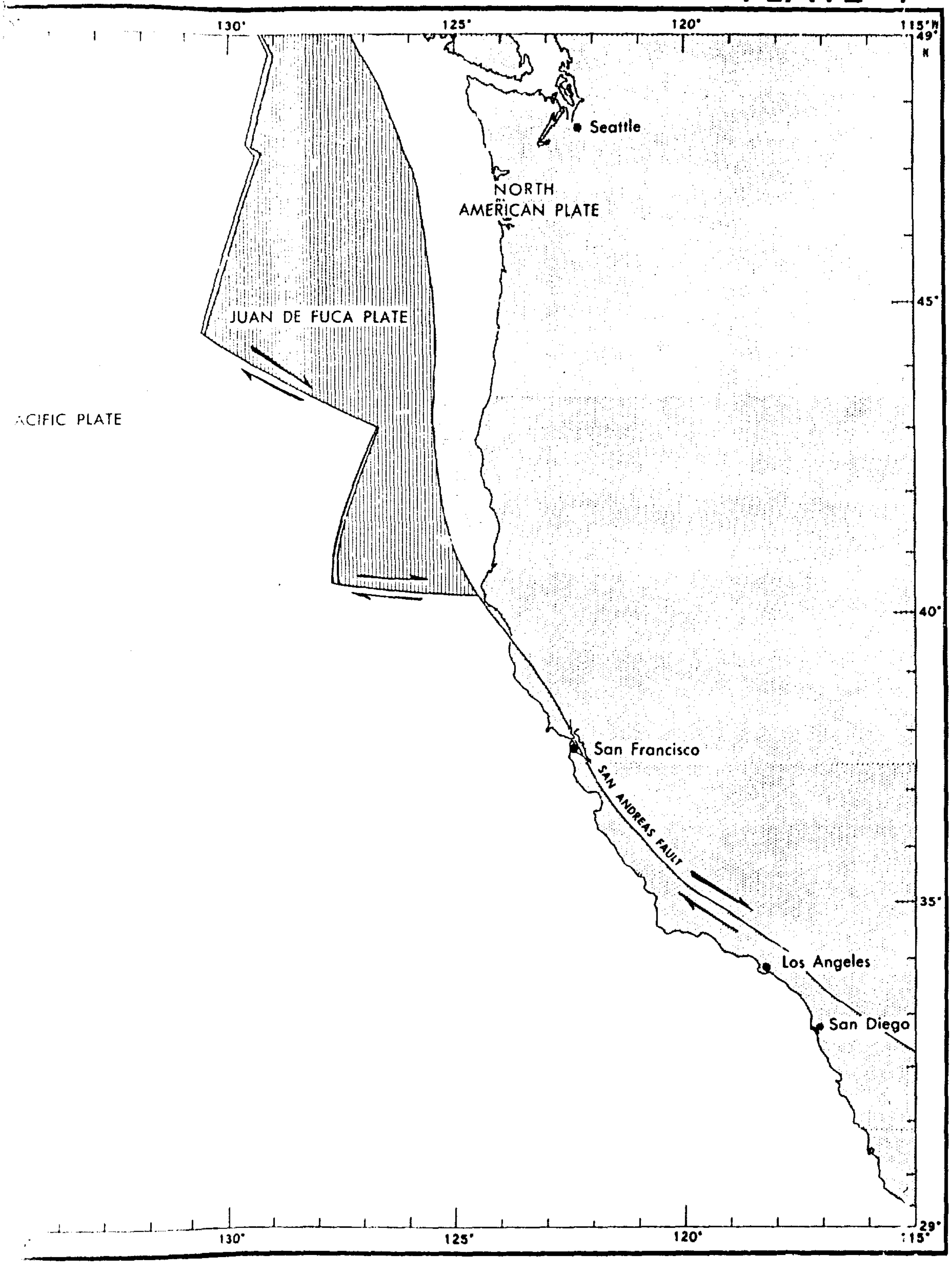
Figure 8. This seismic profile is a 4-second window within the 10-second sweep. Note the draping of sediments over basement.

TECTONIC PLATES OF NP-9



:ONIC PLATES OF NP-9

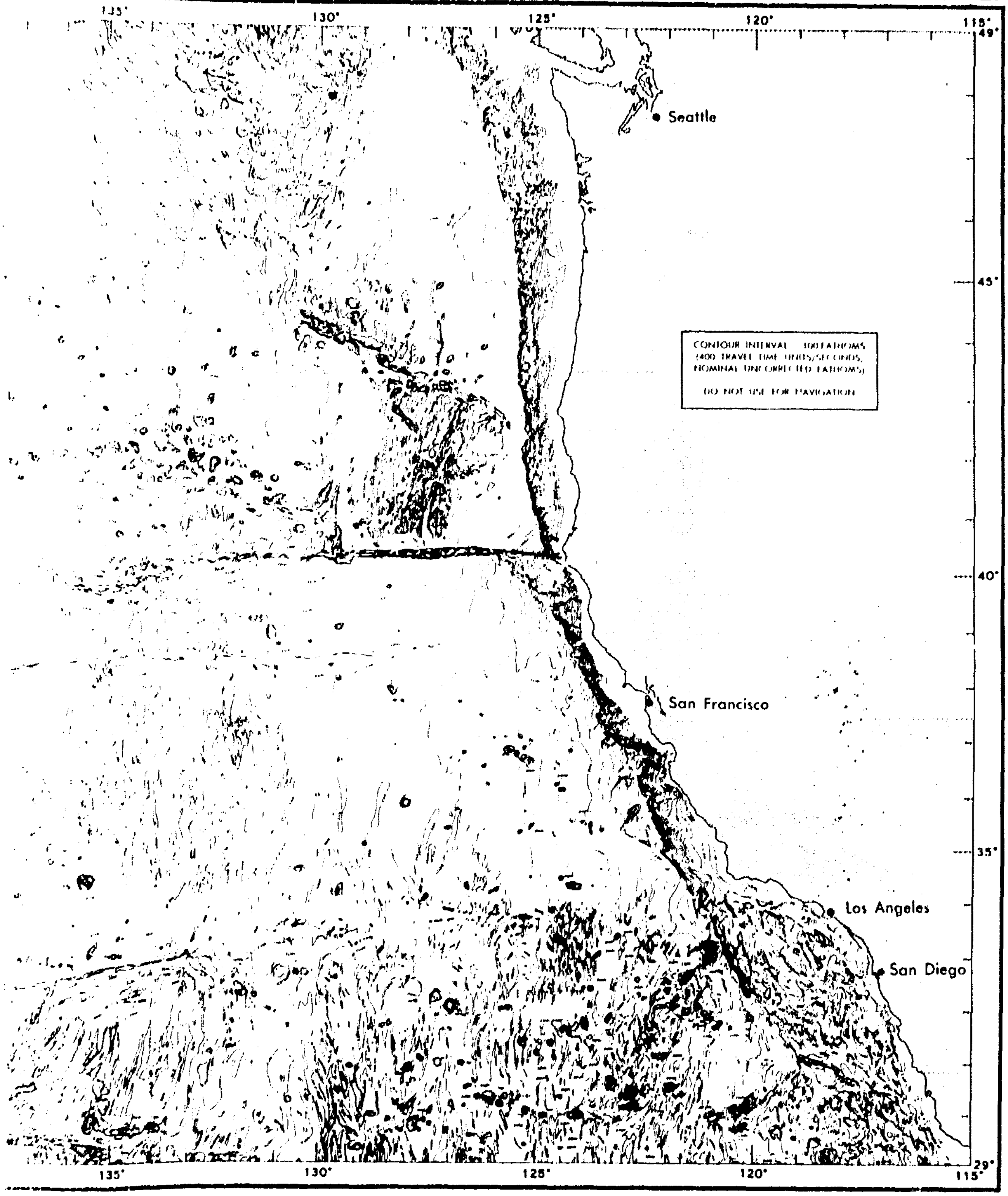
PLATE 1



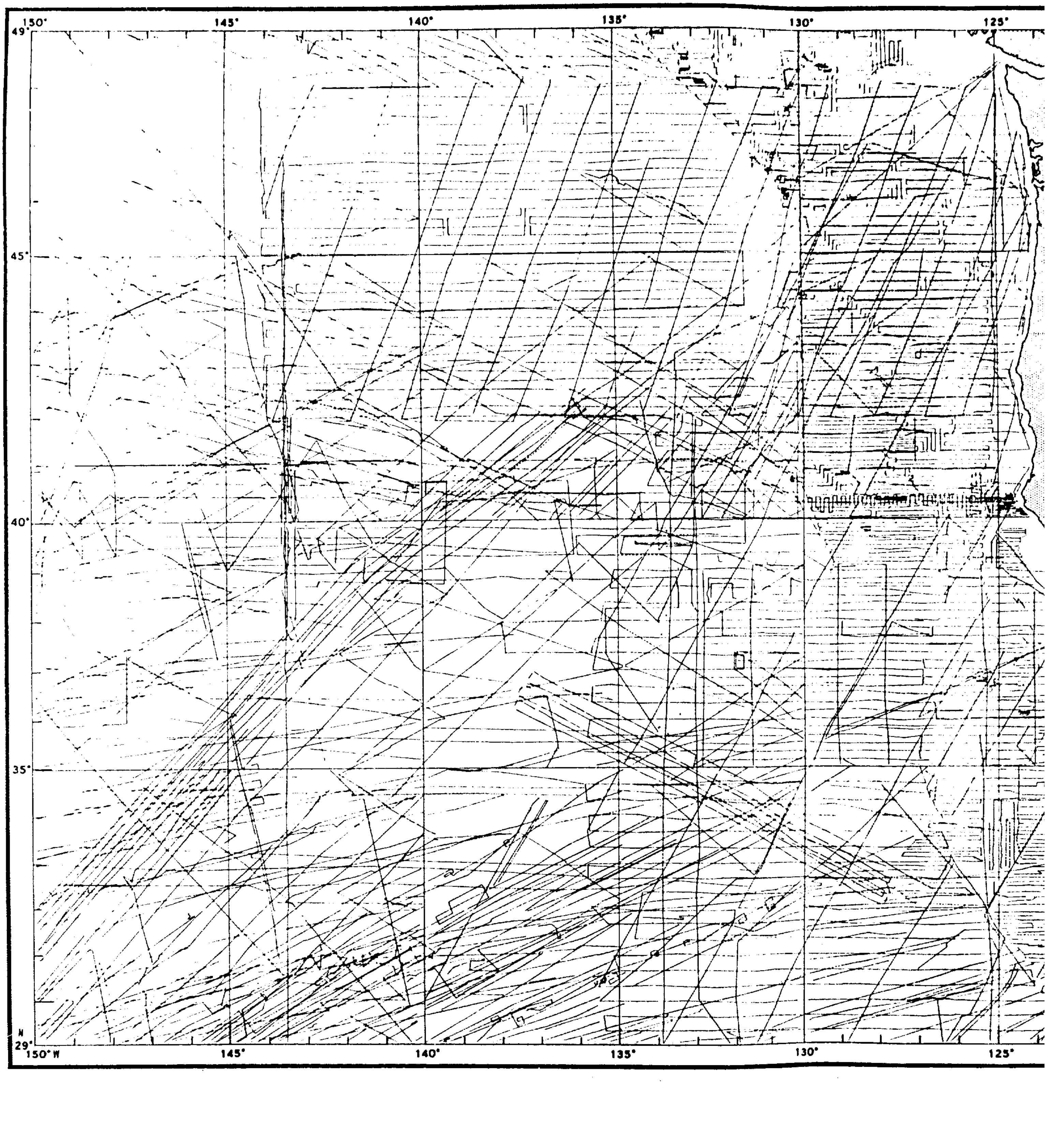
BATHYMETRY OF NP-9

BATHYMETRY OF NP-9

PLATE 2

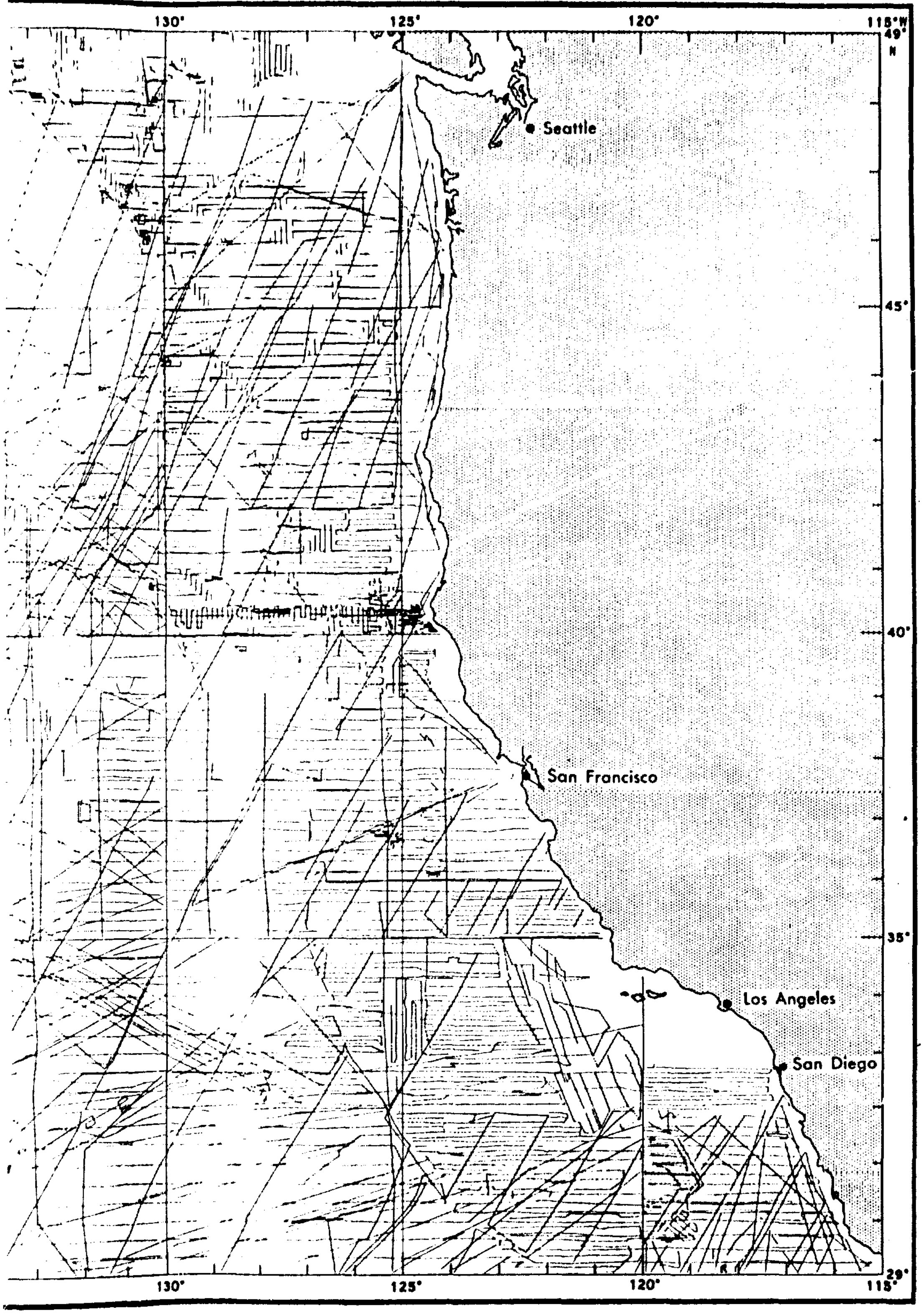


SURVEY TRACK CONTROL FOR THE BATHYMETRY OF NP-9



FOR THE BATHYMETRY OF NP-9

PLATE 3



2

PHYSIOGRAPHIC PROVINCES, NP-9

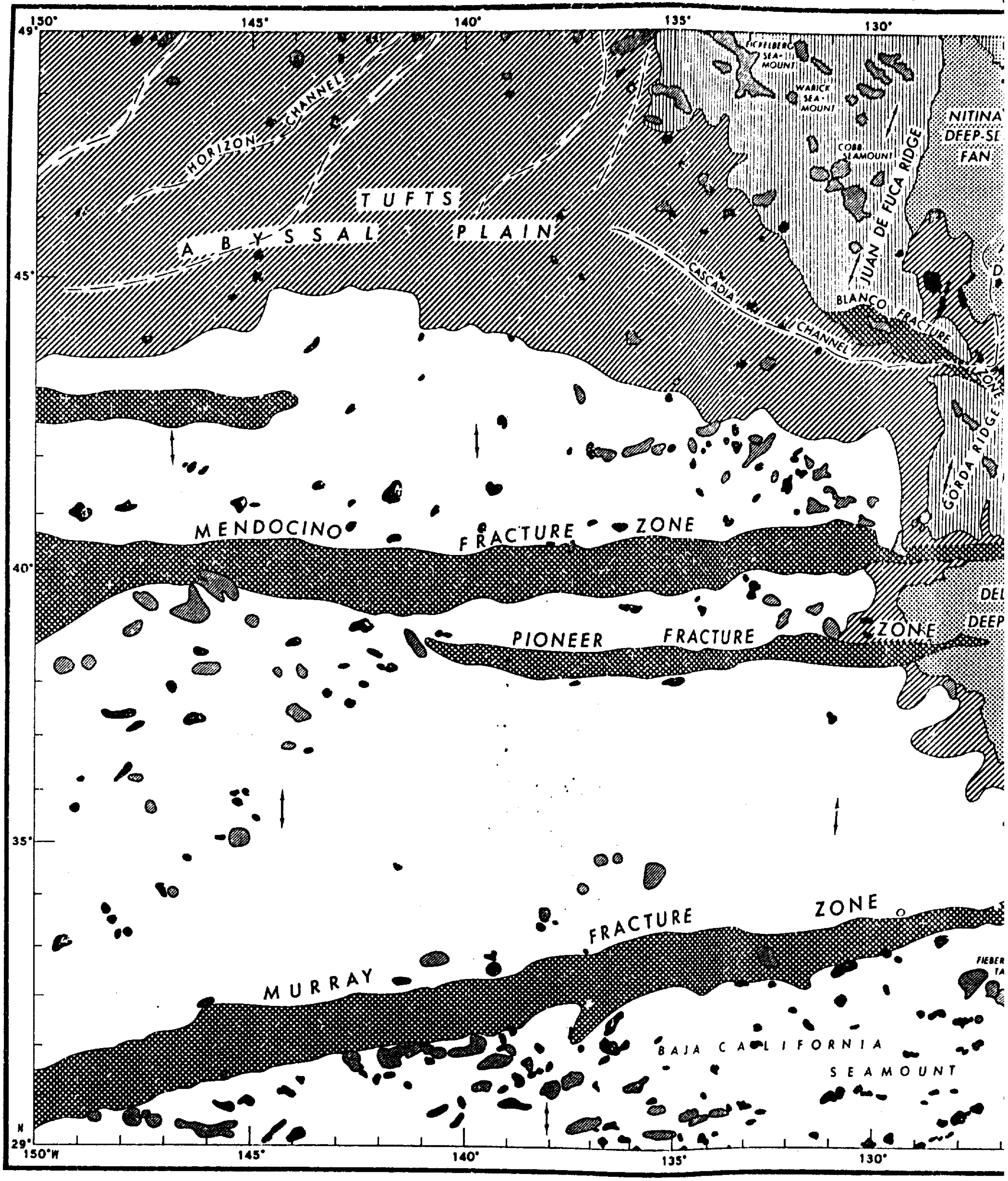
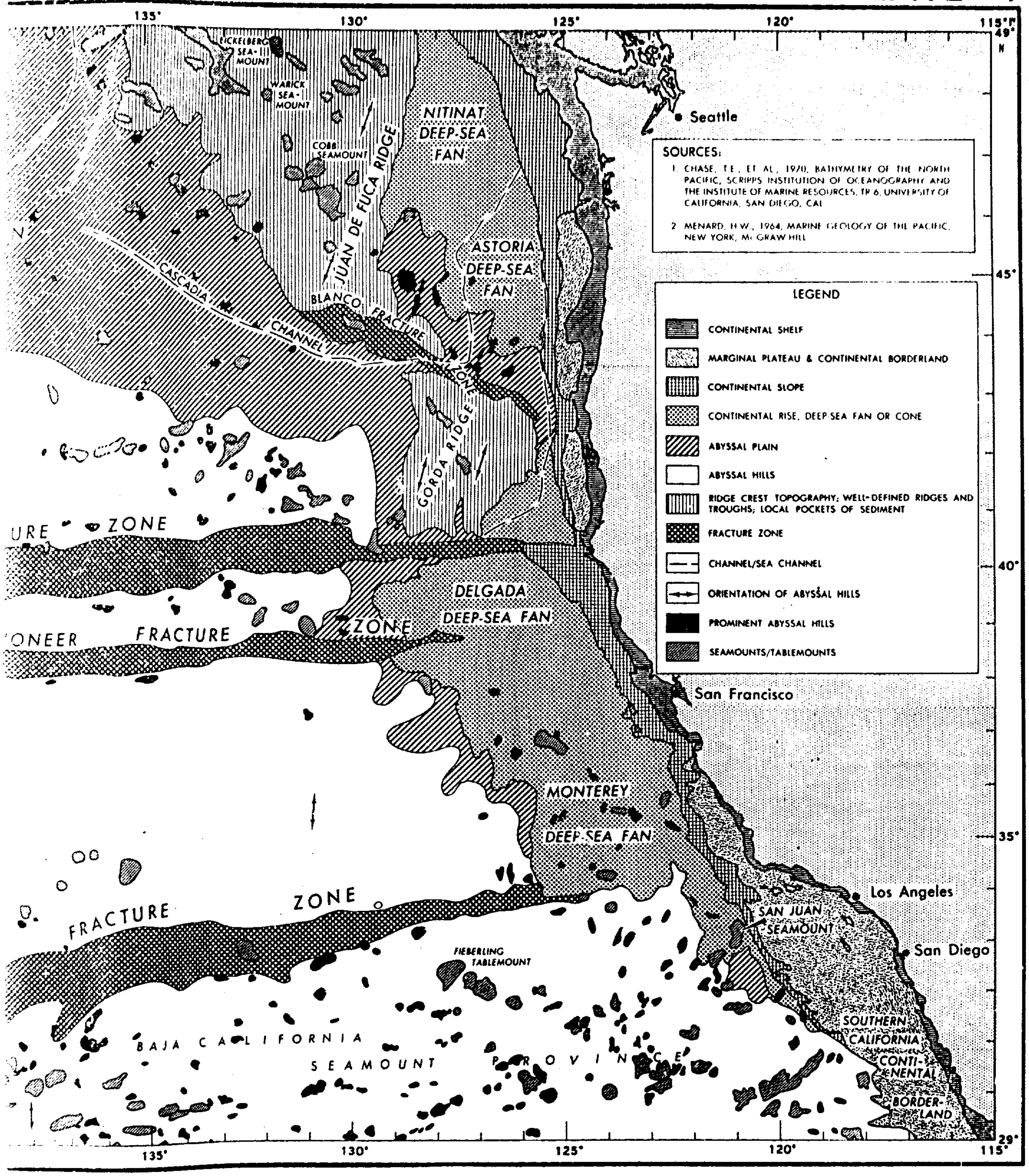
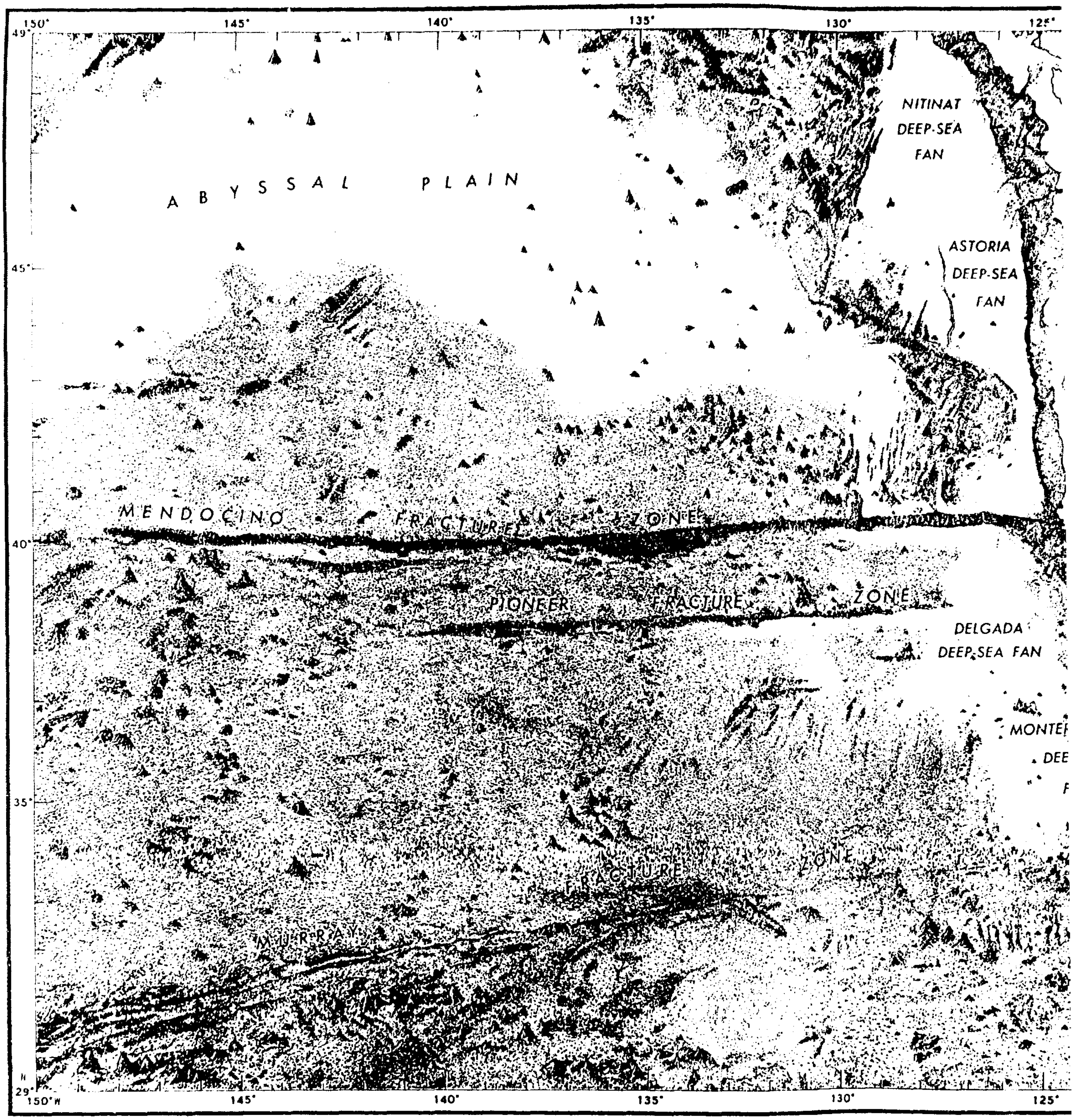


PLATE 4



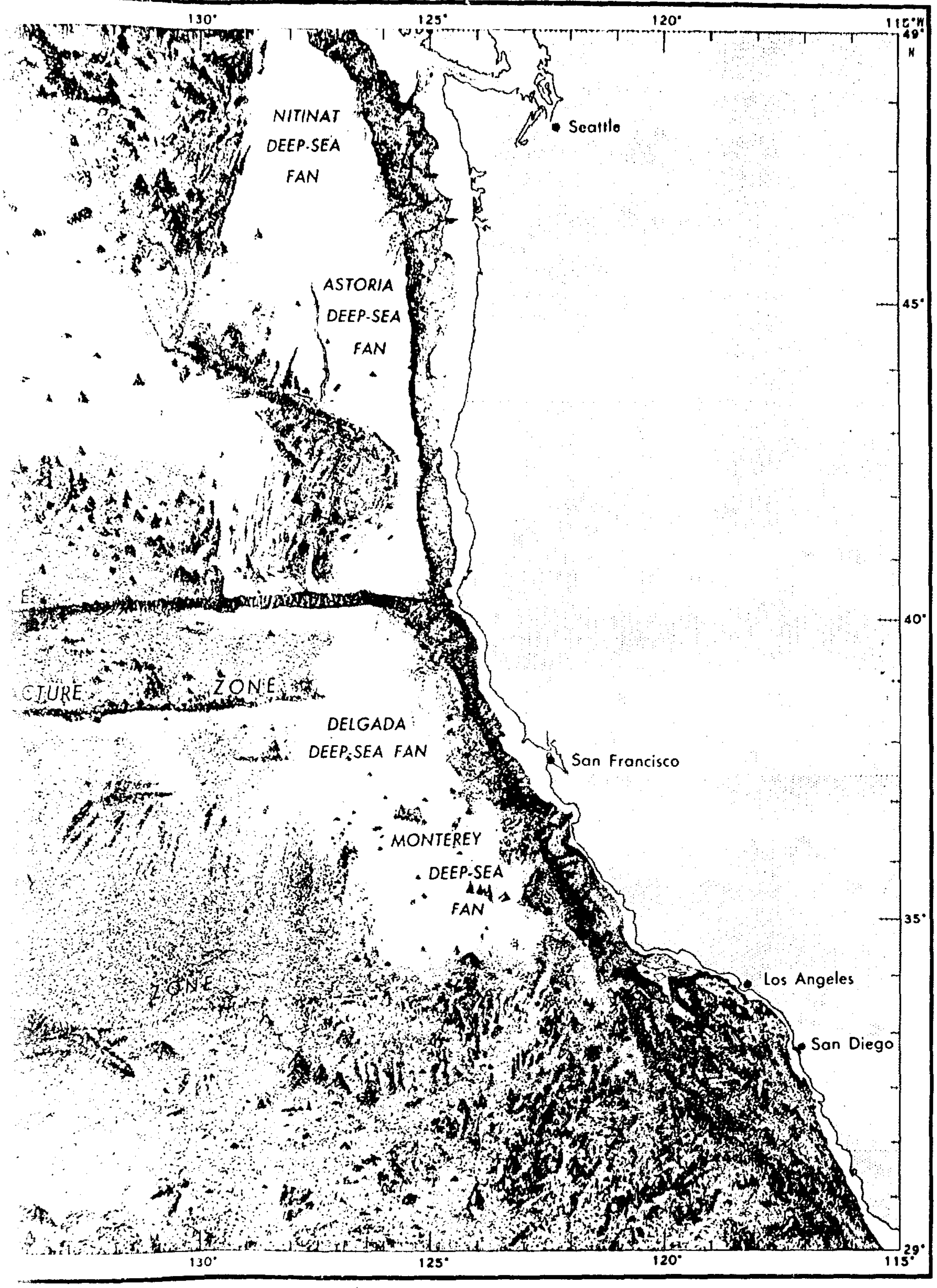
135°
130°
125°
120°
115°
49° N
45°
40°
35°
29°
NITINAT DEEP-SEA FAN
ASTORIA DEEP-SEA FAN
JUAN DE FUCA RIDGE
COBB SEAMOUNT
WARICK SEA-MOUNT
CASCADIA CHANNEL
BLANCO FRACTURE ZONE
GORDA RIDGE
URE ZONE
DELGADA DEEP-SEA FAN
ONEER FRACTURE ZONE
MONTEREY DEEP-SEA FAN
FRACTURE ZONE
SAN JUAN SEAMOUNT
FIEBERLING TABLEMOUNT
BAJA CALIFORNIA SEAMOUNT PROVINCE
SOUTHERN CALIFORNIA CONTI-NENTAL BORDER-LAND
Seattle
San Francisco
Los Angeles
San Diego
SOURCES:
1. CHASE, T.E., ET AL., 1970, BATHYMETRY OF THE NORTH PACIFIC, SCRIPPS INSTITUTION OF OCEANOGRAPHY AND THE INSTITUTE OF MARINE RESOURCES, TR 6, UNIVERSITY OF CALIFORNIA, SAN DIEGO, CAL
2. MENARD, H.W., 1964, MARINE GEOLOGY OF THE PACIFIC, NEW YORK, McGRAW HILL
LEGEND
CONTINENTAL SHELF
MARGINAL PLATEAU & CONTINENTAL BORDERLAND
CONTINENTAL SLOPE
CONTINENTAL RISE, DEEP-SEA FAN OR CONE
ABYSSAL PLAIN
ABYSSAL HILLS
RIDGE CREST TOPOGRAPHY; WELL-DEFINED RIDGES AND TROUGHS; LOCAL POCKETS OF SEDIMENT
FRACTURE ZONE
CHANNEL/SEA CHANNEL
ORIENTATION OF ABYSSAL HILLS
PROMINENT ABYSSAL HILLS
SEAMOUNTS/TABLEMOUNTS

PHYSIOGRAPHIC DIAGRAM OF NP-9



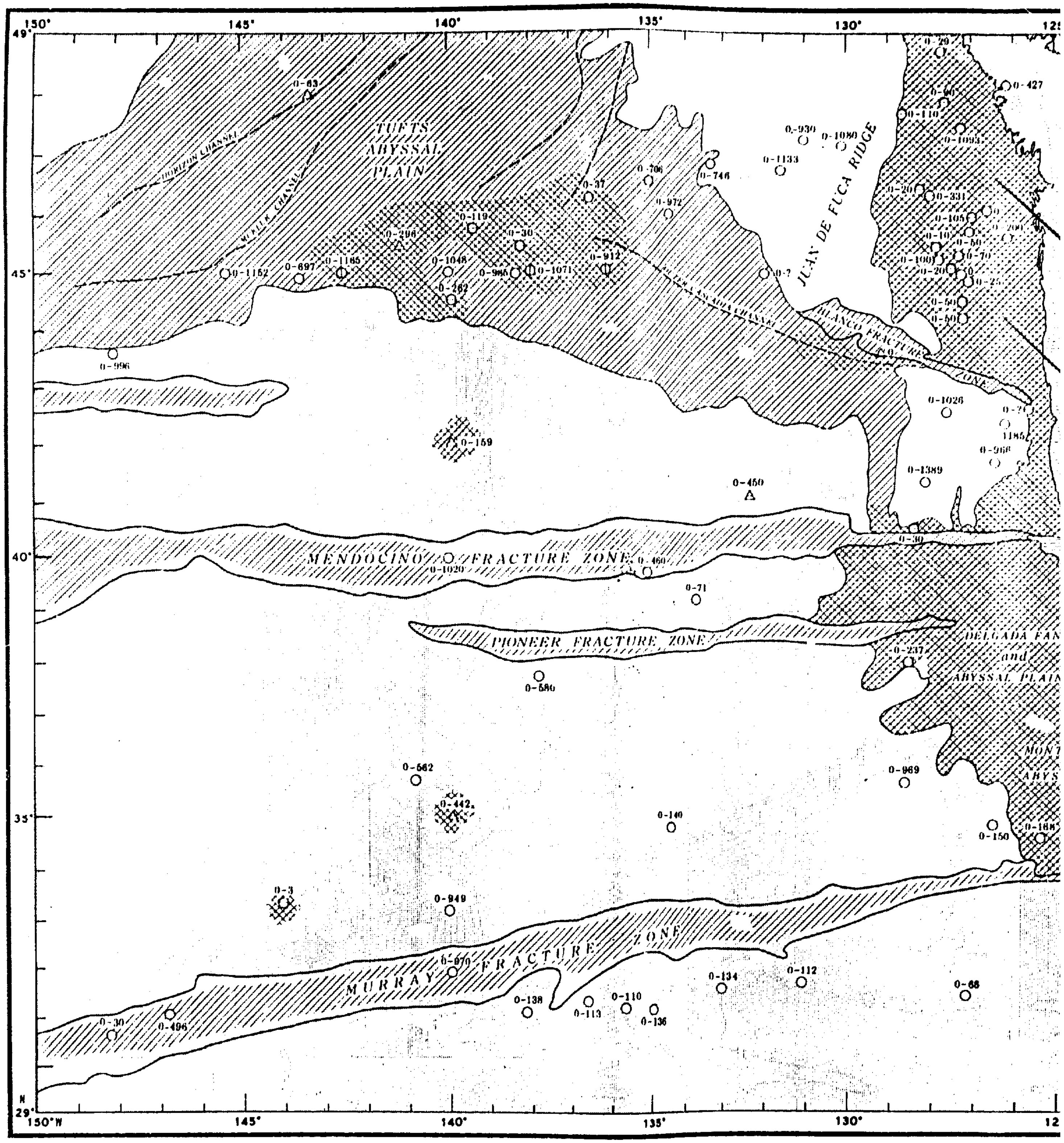
'HIC DIAGRAM OF NP-9

PLATE 5



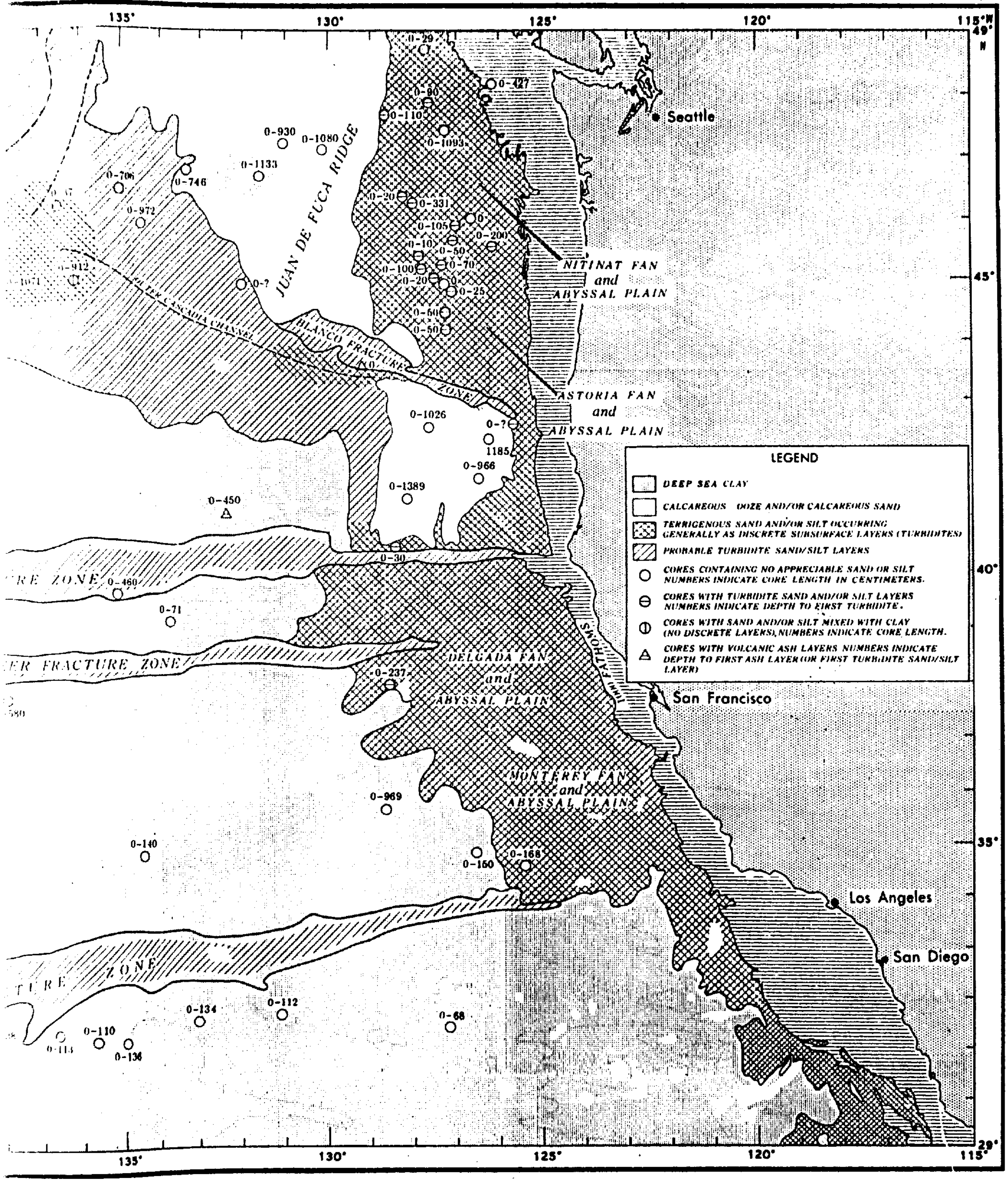
2

SEDIMENT TYPE OF NP-9

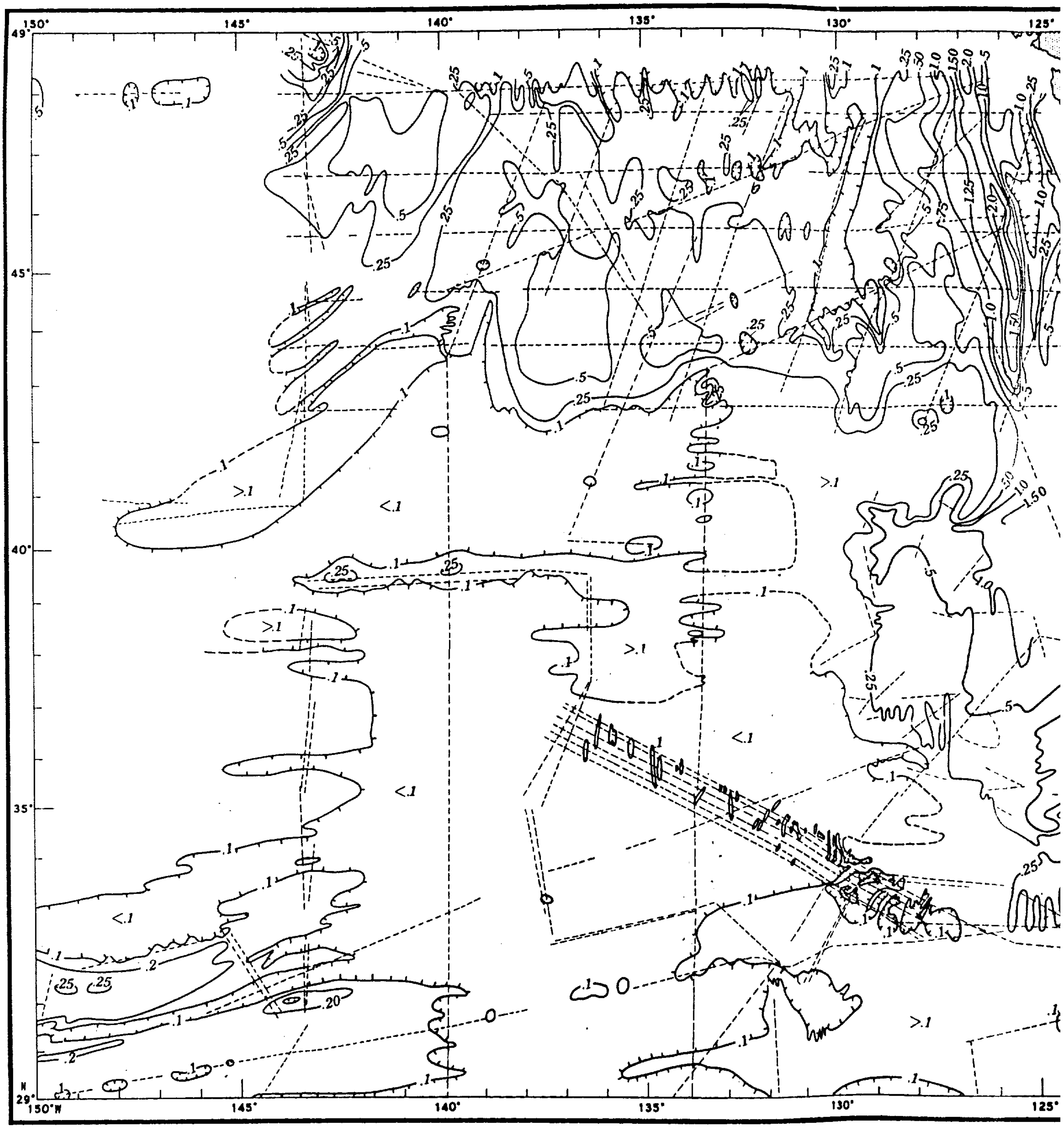


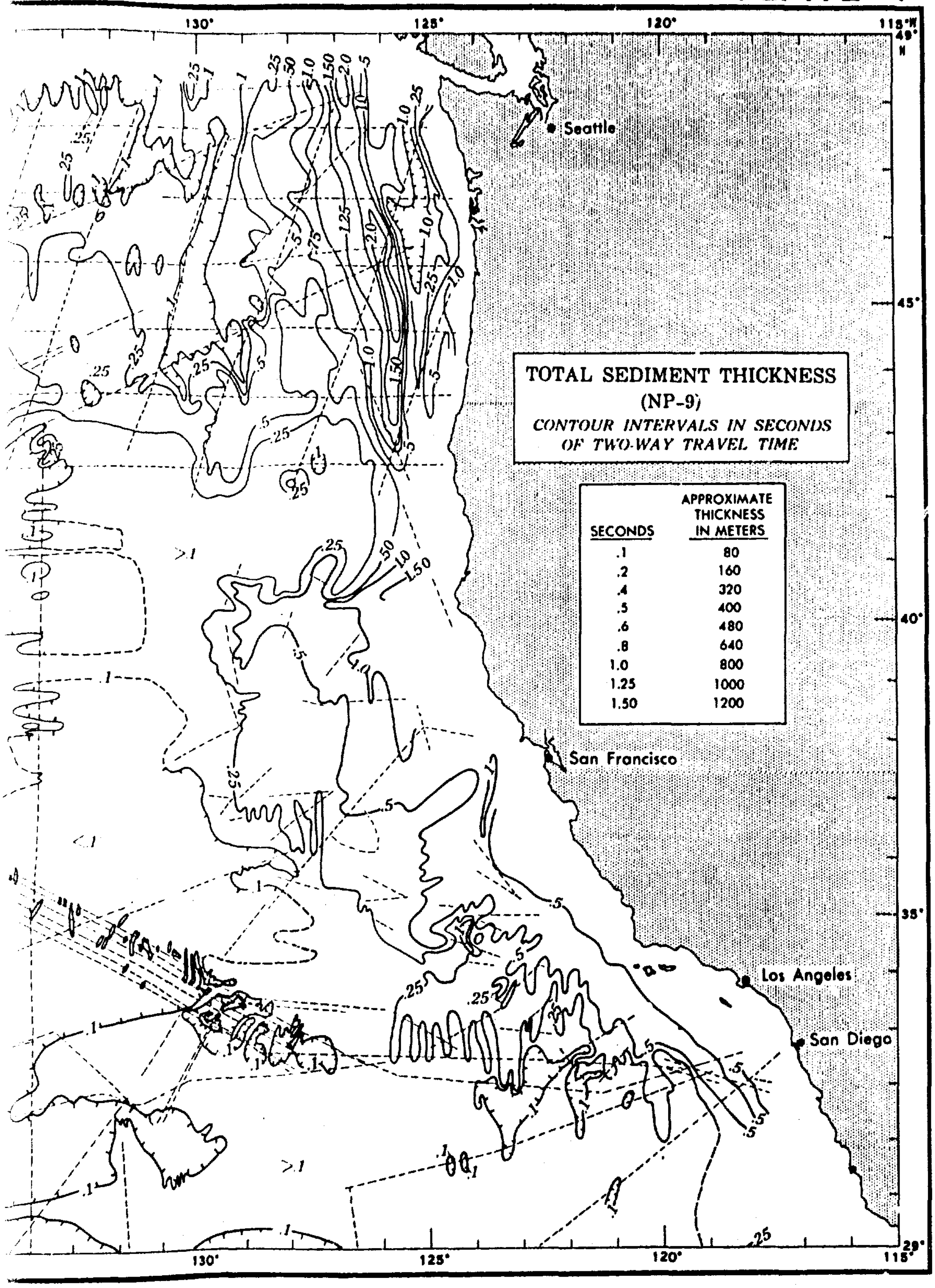
SEDIMENT TYPE OF NP-9

PLATE 6



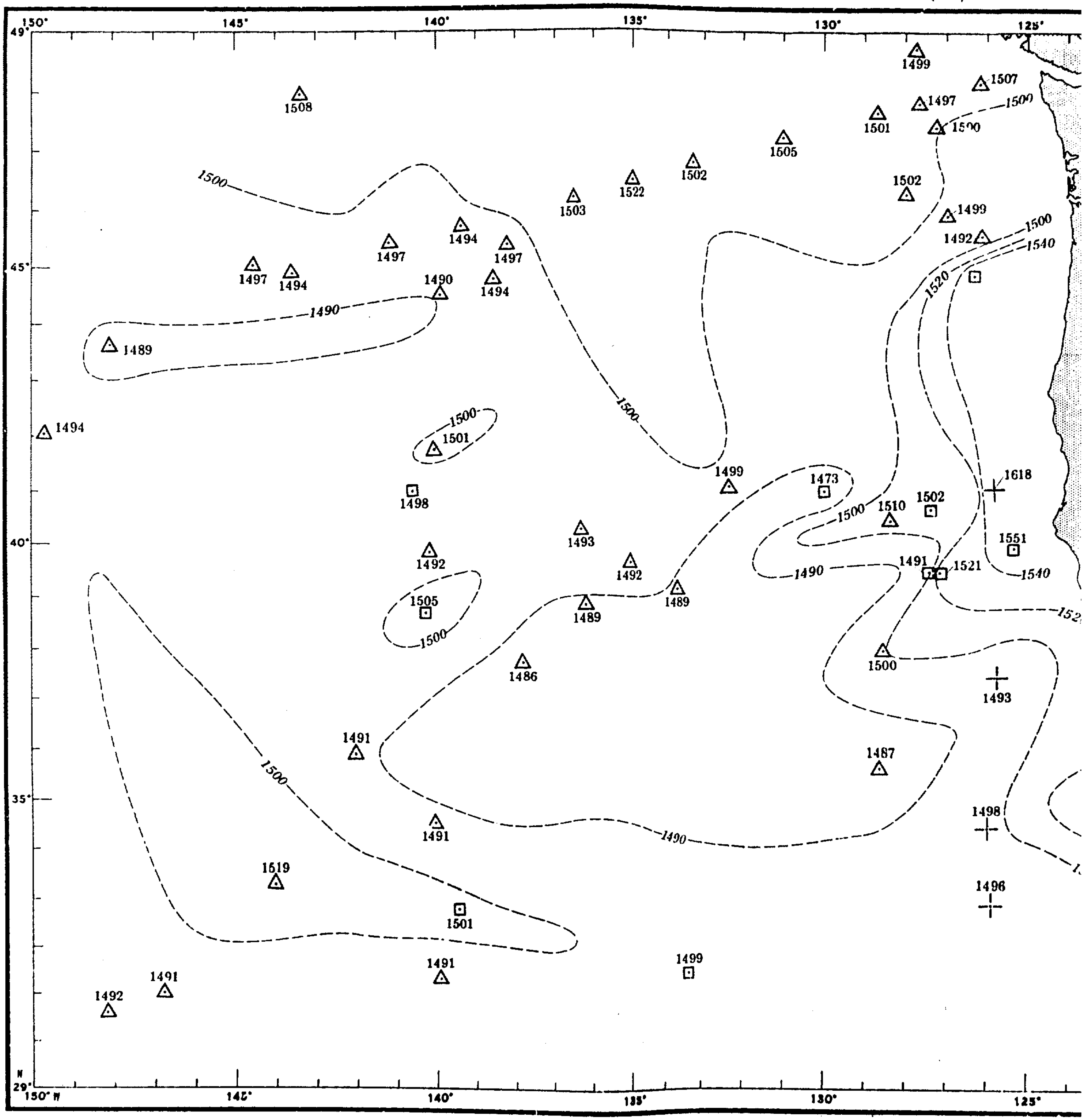
TOTAL SEDIMENT THICKNESS OF NP-9





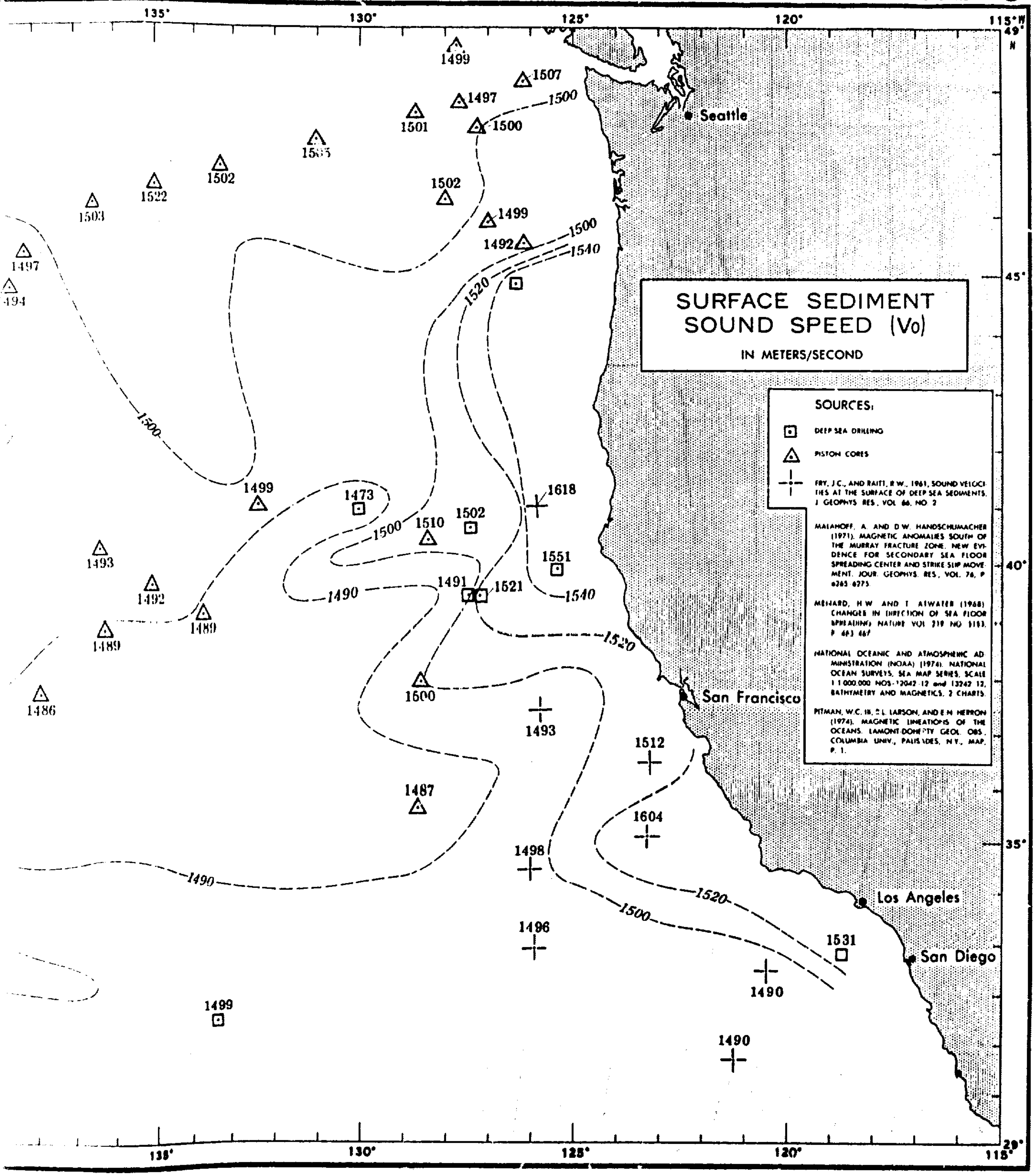
SECONDS	APPROXIMATE THICKNESS IN METERS
.1	80
.2	160
.4	320
.5	400
.6	480
.8	640
1.0	800
1.25	1000
1.50	1200

SURFACE SEDIMENT SOUND SPEED (Vo)



SURFACE SEDIMENT SOUND SPEED (Vo)

PLATE 8



MAGNETIC LINEATIONS OF NP-9

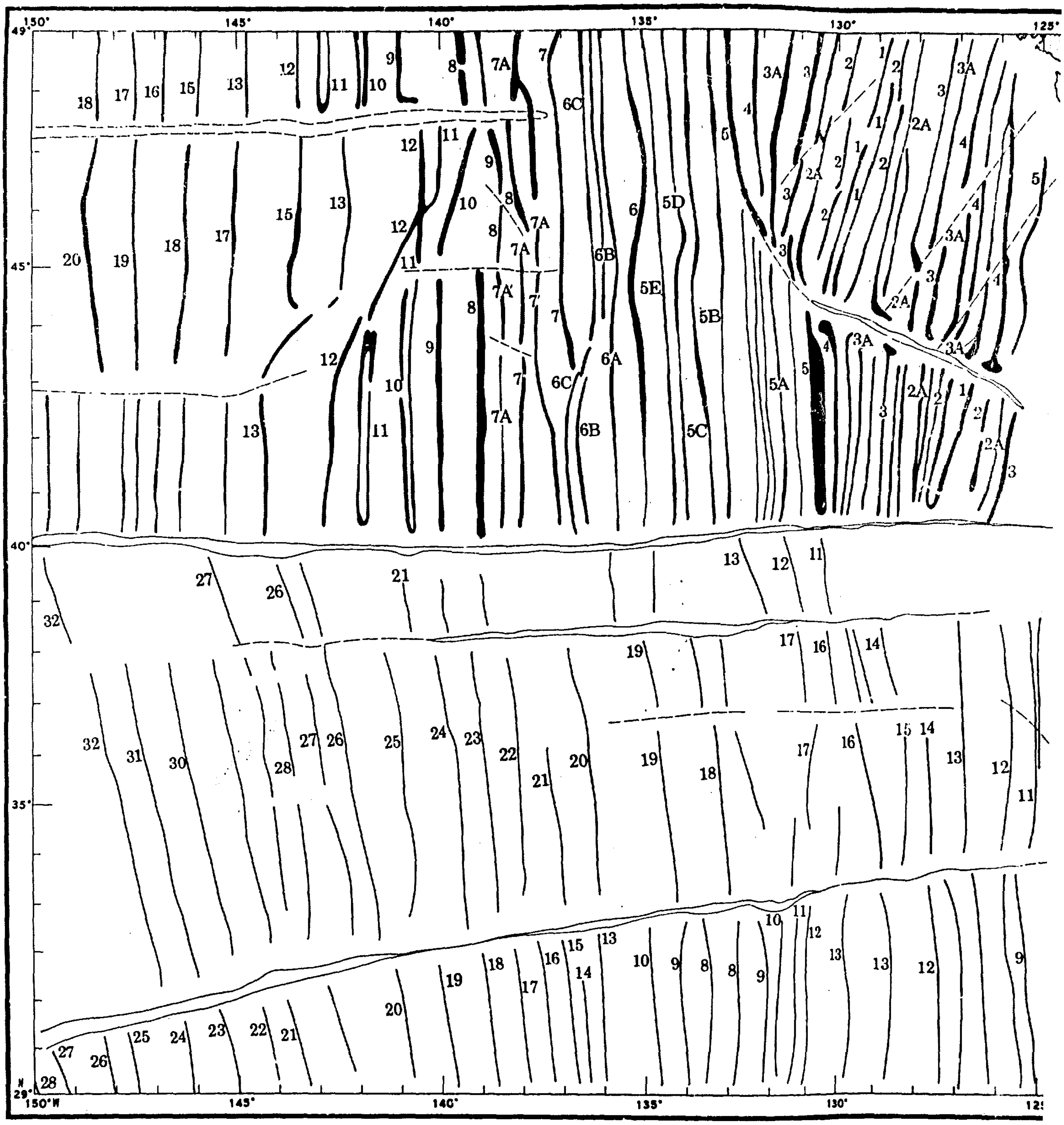
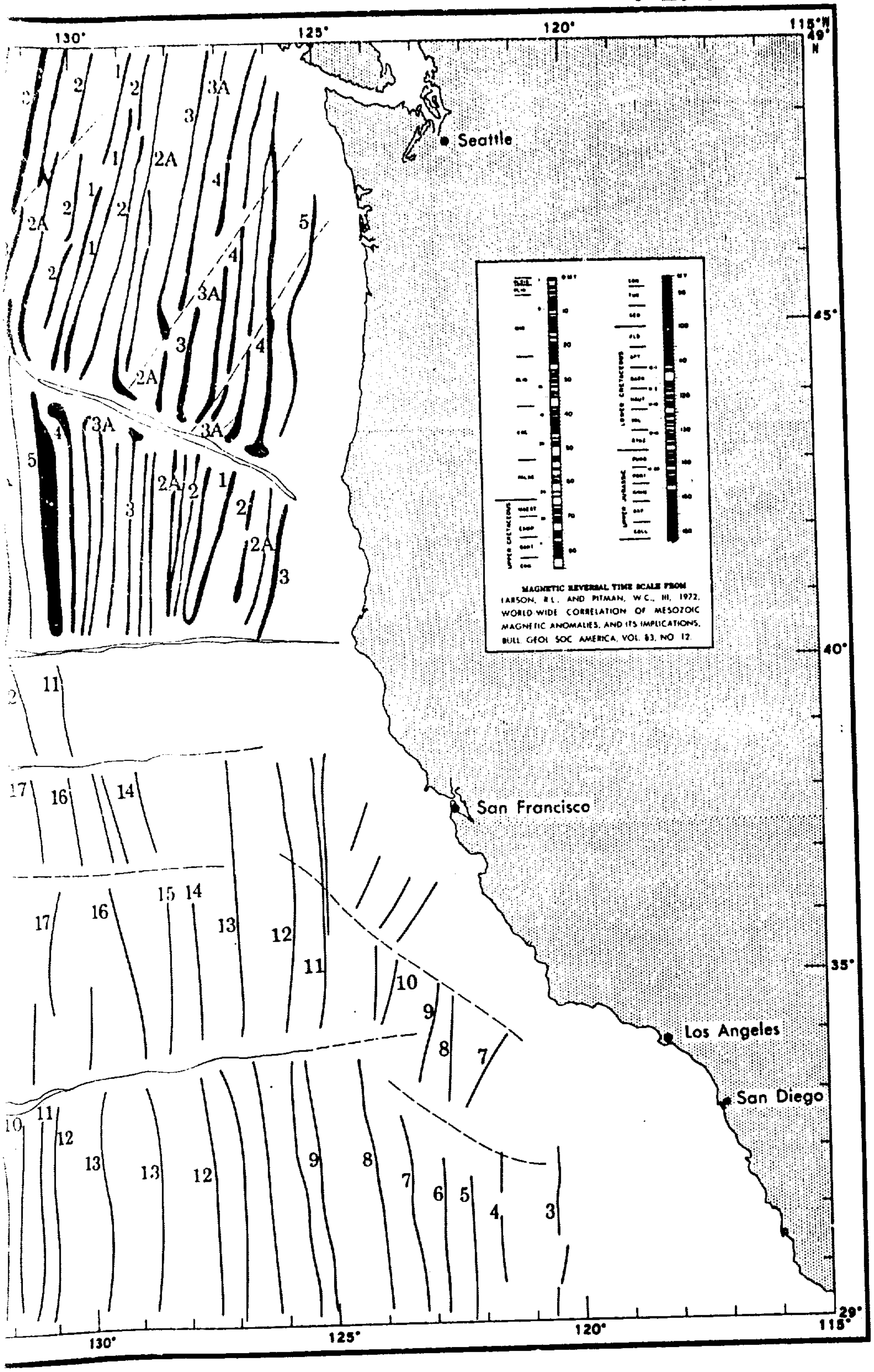
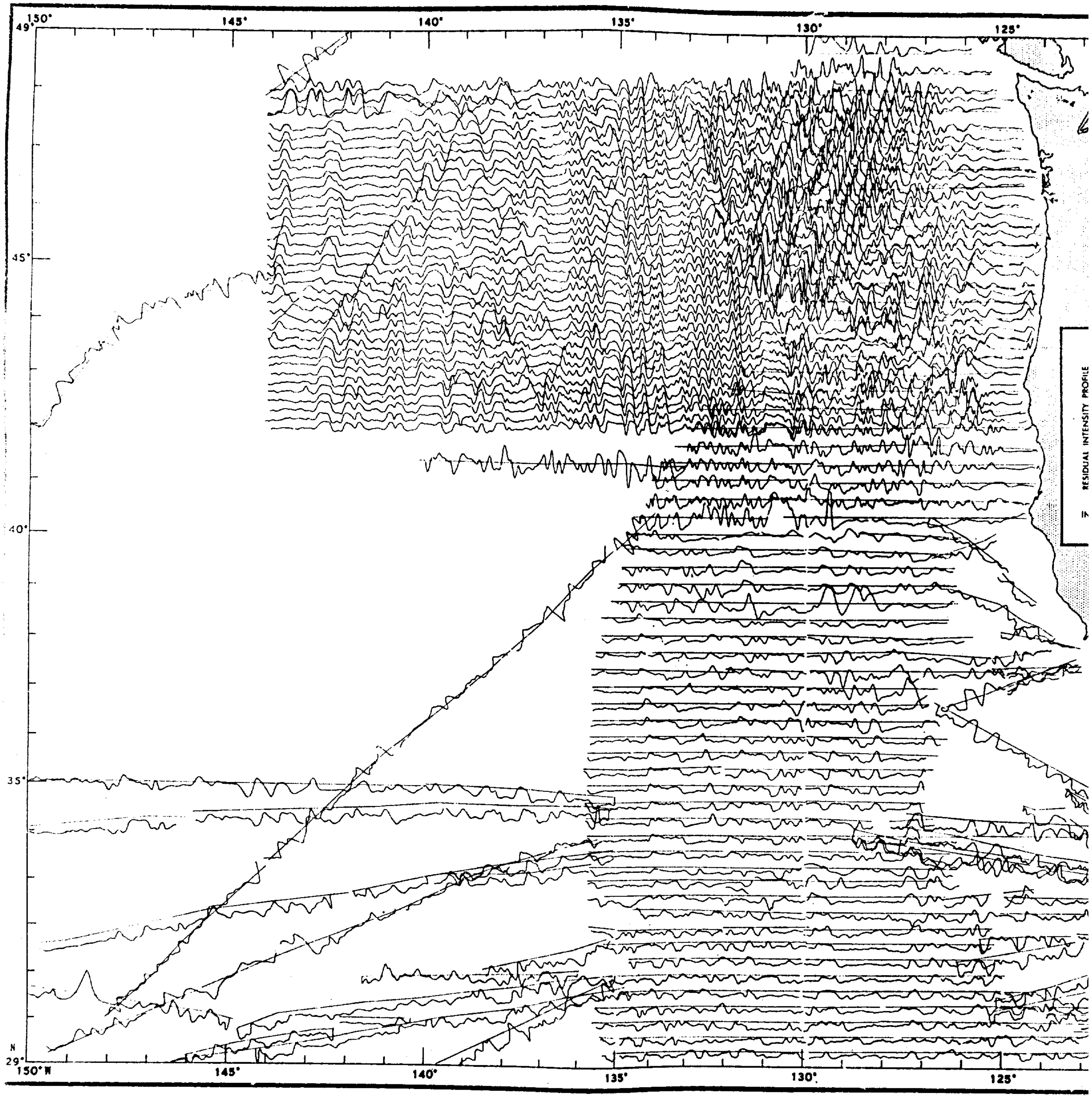


PLATE 9


130°
125°
120°
115°W
49° N
45°
40°
35°
29°
115°
Seattle
San Francisco
Los Angeles
San Diego
MAGNETIC REVERSAL TIME SCALE FROM
LARSON, R.L. AND PITMAN, W.C., III, 1972,
WORLD-WIDE CORRELATION OF MESOZOIC
MAGNETIC ANOMALIES, AND ITS IMPLICATIONS,
BULL. GEOL. SOC. AMERICA, VOL. 83, NO. 12.

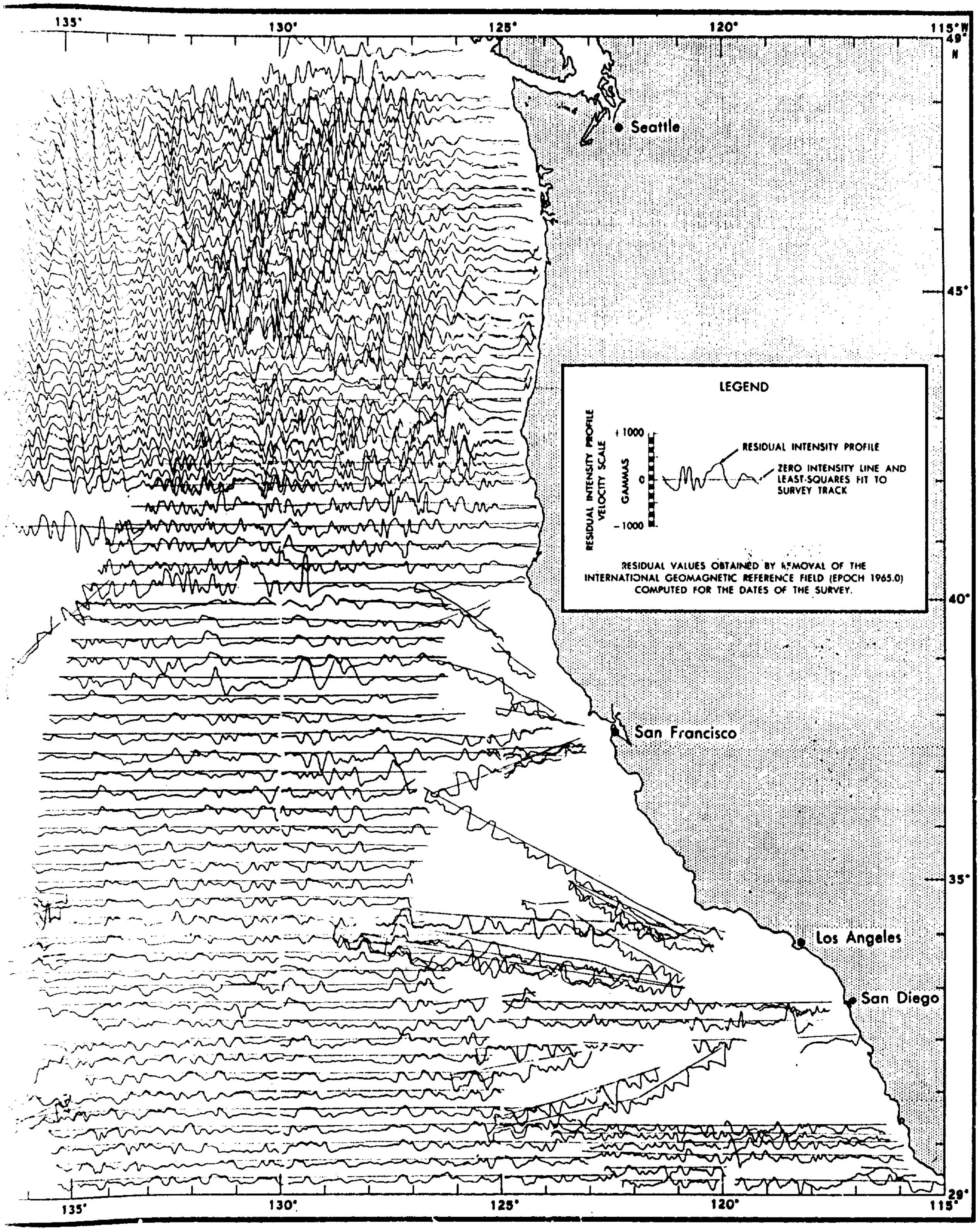
2

RESIDUAL MAGNETIC INTENSITY PROFILE CHART OF NP-9

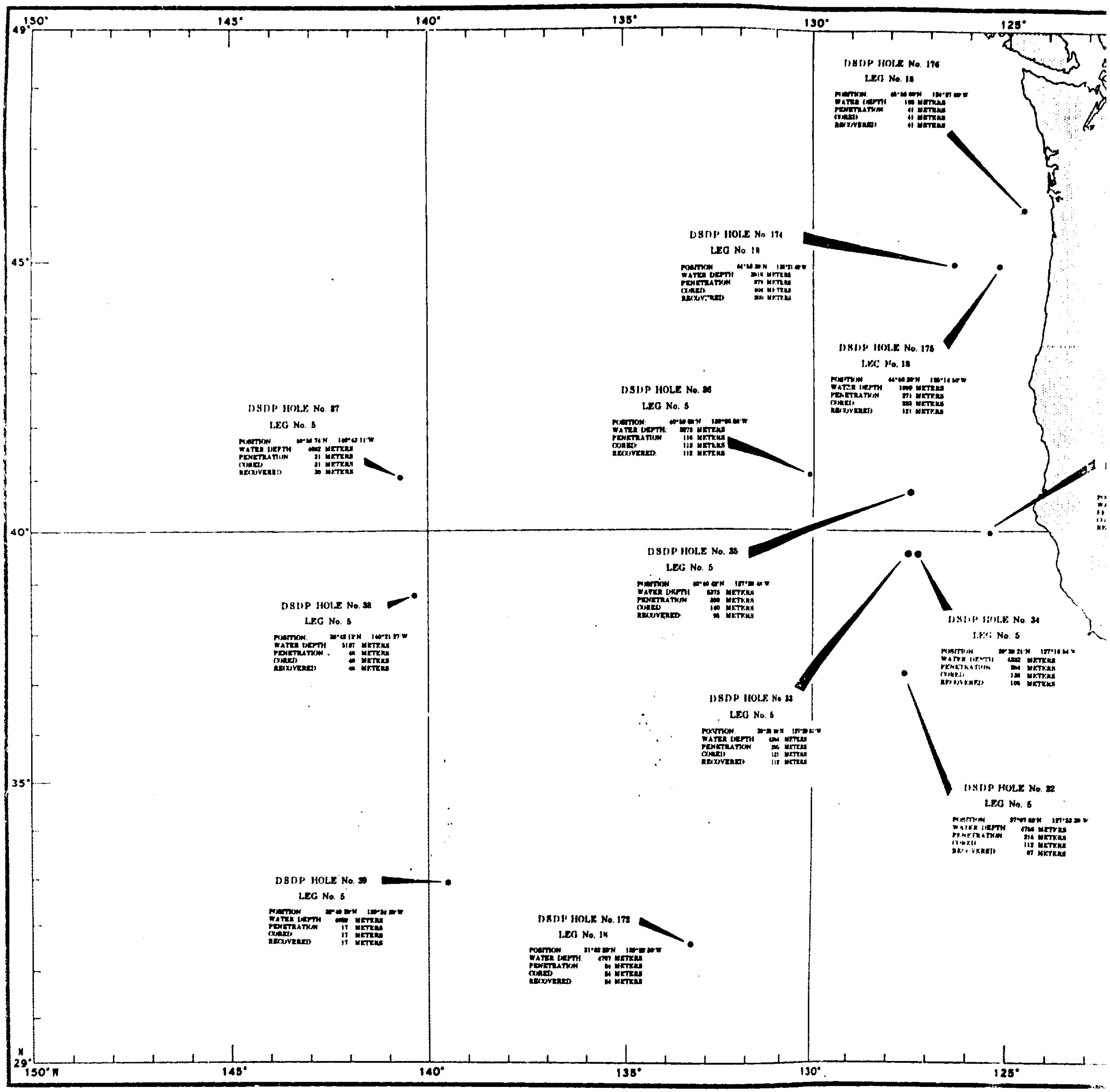


ETIC INTENSITY PROFILE CHART OF NP-9

PLATE 10

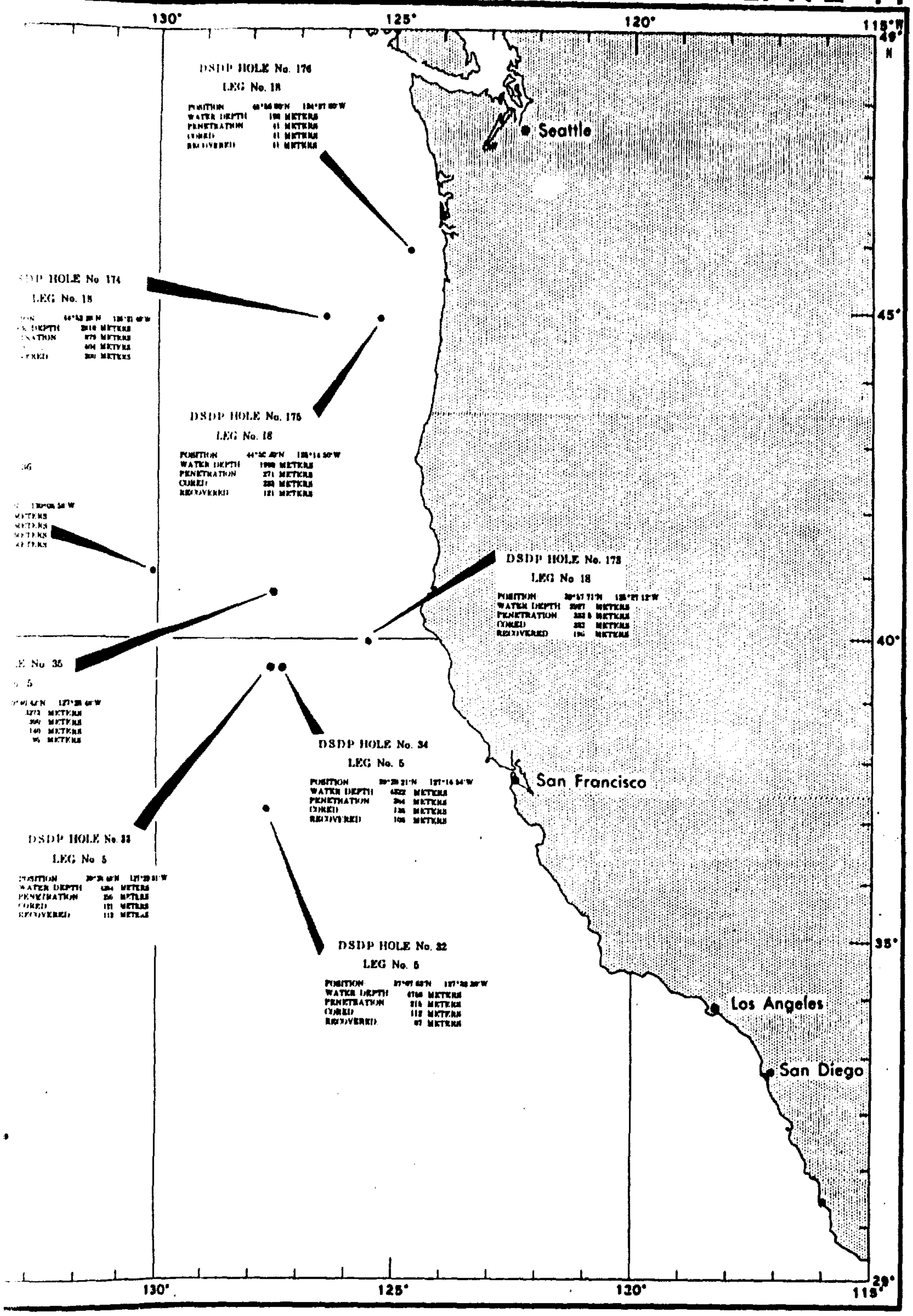


DEEP SEA DRILLING PROJECT (DSDP) DRILL SITES, NP-9



:CT (DSDP) DRILL SITES, NP-9

PLATE 11



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Northeast Pacific

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

Eleven geophysical and geological maps have been compiled for the central northeast Pacific. These maps are based upon bathymetric, magnetic, seismic reflection, and core sample data from all available sources, and contain an estimated 90 percent of the existing data.

Comparison of the maps for the region shows that basement structure controls topography, except near the continental margins where alluvial fans have exerted the dominant influence. Continental margin and abyssal plain

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deposits flank the actively spreading Gorda and Juan de Fuca Ridges.

Interpretations have been deliberately limited so that emphasis could be placed on the criteria used for evaluating data and compiling maps. References have been cited in sufficient number to provide a general reading guide for further study.

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